ATT-TP-76200

NETWORK EQUIPMENT POWER, GROUNDING, ENVIRONMENTAL, AND PHYSICAL DESIGN REQUIREMENTS

To:	Telecommunications Equipment Suppliers
Effective Date: **Issue Date:**	See paragraph 1.21. September 30, 2008
Expires On:	N/A
Related Documents:	Telcordia GR-63-CORE, ISSUE 3, GR-1089-CORE, ISSUE 4, GR-78CORE, ANSI T1.307, T1.315, T1.319, and T1.329
Cancelled Documents:	AT&T Services, Inc., ATT-TP-76200, Issue 12, June 20, 2008, AT&T Corp. Inc., ATT 801-900-160, Network Equipment Design Standards (NEDS), Issue 5, Bell South Telephone TR73638BT, NEBS Compliance Handbook, Issue 1.
Issuing Department:	Network Staff, GES Common Systems
Business Unit:	AT&T Services Incorporated
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1 GENERAL

1.1. Requirements and Objectives

This section provides the requirements and objectives for the power, grounding, environmental, and physical design of telecommunications equipment intended for use in network facilities, including outside plant and customer's premises. The appendices included in this section discuss AT&T's product evaluation process and identify the type of product information required from product suppliers for the product evaluation process.

1.2. Purpose

The purpose of this section is to provide product suppliers with a comprehensive reference of equipment requirements and objectives for the subjects covered. A product's compliance with the requirements and objectives of this section will not be the sole basis for the acceptance of the product, however noncompliance with one or more of the requirements or objectives of this section may be the basis for a product's denial of purchase.

1.3. Scope

Unless otherwise stated, the requirements contained herein apply to equipment systems and assemblies intended for installation in all AT&T Local Exchange Carrier affiliates, Internet Services, and Advanced Services, Inc. network equipment buildings, equipment areas within buildings, electronic equipment enclosures such as controlled environmental vaults, outside electronic equipment cabinets, and customer locations.

1.4. Definitions

A. The term **product supplier** as used throughout this section refers to the equipment manufacturer or agent of the equipment manufacturer, whichever is appropriate for the product being considered.

B. The term **company representative** as used throughout this section refers to the AT&T employee representing AT&T

C. Requirements are those product features that **must** be provided by the equipment manufacturer. The words "shall" and "must" are used throughout this section to identify requirements.

D. Objectives are product features that are **desired** for the long term use or application. The word "should" is used throughout this section to identify objectives.

1.5. ATT-TP-76200 Internet Web Site

Copies of this document and general information about AT&T's environmental equipment standards may be found at https://ebiznet.sbc.com/sbcnebs/.

1.6. Product Evaluation Process

AT&T Services' Product Evaluation Process is documented in Appendix A.

NOTE: Unless the AT&T Fast Track process is used (see Appendix A), for requirements that call for testing to verify conformance, test reports **must** be forwarded to AT&T for review before the product will be approved for use.

1.7. Requirement Levels

Equipment must demonstrate conformance to subsets of requirements contained in ATT-TP-76200 depending on the intended application and deployment location(s) of the equipment. Specific requirements for each level and location are identified in the corresponding Equipment Supplier Response (ESR) matrix forms located in Section 12 and identified in Table 1-1. See Appendix A for processes required to document conformance to requirements.

A. **LEVEL ONE (ESR-001).** Level One refers to a subset of ATT-TP-76200 requirements that form the minimum acceptable safety requirements necessary to protect personnel and the network. Level One is applicable for Collocator's equipment and may be applicable for AT&T equipment that critical to the network(e.g. monitoring and test equipment). This level should only be used if it is specified in this document or directed by AT&T representative.

B. **LEVEL TWO (ESR-002).** Level Two refers to safety and modified reliability requirements for equipment placed only in Mission Critical Data Rooms (see 1.7, D). Some reliability requirements are modified to account for the increased environmental control in these facilities. This level should only be used if it is directed by an AT&T representative.

C. **LEVEL THREE - (ESR-003-XXX).** Level Three refers to the maximum applicable ATT-TP-76200 safety and environmental reliability requirements for equipment deployed in the network. Unless otherwise detailed in this document or instructed by AT&T, Level Three is the applicable level for all network equipment.

D. **ANCILLARY (ESR-ANC)** (Level 1, 2 or 3). Ancillary requirements refer to a subset of Level Three requirements that apply to additions to or changes to equipment previously approved for use in AT&T. If a change to an existing product, or sub-system of the product, results in the assignment of a new CLEI code, the product shall be evaluated for compliance to Ancillary requirements. See Appendix B for guidelines applicable to special considerations for testing of enhanced products.

1.8. Network Equipment Deployment Locations

A. **CENTRAL OFFICE (CO)** - AT&T buildings dedicated to telecommunications switching and transport equipment. Due to national, state and local codes specific to these buildings, there are ATT-TP-76200 requirements that are specific to COs (e.g., GR-63 Fire Spread). CO equipment requirements also apply to OSP Huts, CEVs, and other OSP enclosures with active environmental controls.

B. **NON-CENTRAL OFFICE BUILDING -** Buildings other than Central Offices. These buildings may be AT&T owned, AT&T leased or customer owned. Equipment is installed on the AT&T side of demark in customer premises locations. Due to national, state and local codes specific to these buildings, there are ATT-TP-76200 requirements that are specific to non-CO buildings (e.g. NRTL listing). A special category of non-central office building equipment is:

- **Mission Critical Data Room -** Dedicated Data Room compliant to TIA-942, Telecommunications Infrastructure Standard for Data Centers, including:
    - Dedicated HVAC with HVAC back-up
    - Temperature range 20^{o}C to 25^{o}C
    - Humidity range 40% – 55% RH

C. **OUTSIDE PLANT (OSP) –** Outside plant part of the network. Typically network locations between the inside of COs, Non-CO buildings and Customer Premises. There are three levels of OSP environments:

- **OSP Class Two** refers to an internal environment typical to GR-487 compliant remote cabinets, per Telcordia GR-3108-CORE.
- **OSP Class Three** refers to an internal environment typical of GR-487 non-compliant remote cabinets, per Telcordia GR-3108-CORE.
- **OSP Unprotected** refers to an open, unprotected environment such as ONTs, and active NIDs (iNIDs), etc where the equipment electronics are an integral part of the enclosure.

Table 1-1
ESR Forms for Evaluation Levels and Locations*

	Level One	**Level Two**	**Level Three**	**Ancillary**
Central Office	ESR-001	n/a	ESR-003-CO	ESR-ANC
Non-CO Building	ESR-001	n/a	ESR-003-NCO	ESR-ANC
MC Data Room	ESR-001	ESR-002	ESR-003-NCO	ESR-ANC
OSP Class Two	ESR-001	n/a	ESR-003-OSP	ESR-ANC
OSP Class Three	ESR-001	n/a	ESR-003-OSP	ESR-ANC
OSP Unprotected	ESR-001	n/a	ESR-003-OSP	ESR-ANC

*Equipment must conform to requirements for each location and/or application for which it is intended.

1.9. Product Change Notices (PCNs)

PCNs must be evaluated for their effect on the equipment's ATT-TP-76200 compliance.

A. When it is determined by the manufacturer, using sound engineering judgment, that a hardware or software change does not impact the equipment's ATT-TP-76200 compliance, the manufacturer may submit a letter of attestation to this effect. See Appendix A, paragraphs and 15.6.

   NOTE: Except when it is obvious that the PCN will not affect the equipment's compliance, AT&T Services recommends that an accredited, third party, independent laboratory evaluate whether testing is required to verify compliance.

B. When the manufacturer, a test lab or AT&T Services determine that the PCN may affect the equipment's ATT-TP-76200 compliance, the modified equipment must be tested per ATT-TP-76200, Ancillary Requirements (ESR-ANC).

   NOTE: Depending on engineering judgment, not all requirements may need to be tested.

1.10. AT&T Test Laboratory Entry Requirements

The primary purposes of lab entry requirements for equipment under test are to ensure the safety of personnel and property. It is the objective of this requirement that verification of compliance to industry safety standards be provided for equipment prior to lab entry. However, due to needs of the business and the fact that the lab is staffed by personnel trained to work with prototype equipment, there are times when it may be necessary for AT&T to allow equipment into its lab that has not been verified in compliance to safety standards. In those cases it is incumbent upon the manufacturer to assure the equipment is safe to operate. AT&T labs will assess acceptance and test protocols for this equipment on a case-by-case basis.

A. Objective: Prior to entry into AT&T labs, equipment should be compliant to ATT- TP-76200 Central Office Level 1 requirements, or Non-Central Office Level 1 requirements, or be Listed (e.g. UL 60950).

C. Requirement: If equipment does not meet the above objective, the manufacturer shall submit a notarized Letter of Attestation (LOA) that the equipment meets industry electrical safety, electromagnetic emissions and fire safety standards

NOTE: The above requirements are applicable only for AT&T laboratory testing. All applicable ATT-TP-76200 and ATT-TP-76450 requirements must be evaluated as in conformance prior deployment into the network.

1.11. Portable Test Equipment

At a minimum, portable test sets, including OSP test sets, will be reviewed to the following requirements prior to deployment:

- Electrical Safety Review: An electrical safety review is necessary when the output voltage of the equipment exceeds 140 volts DC or 50 volts rms AC.

- Radiated Emissions: A review is necessary when the equipment supplier cannot certify compliance to FCC Part 15. In the absence of FCC Part 15 compliance, the radiated emissions requirements and test methods of GR-1089, Section 3 shall apply.

NOTE: Portable test sets that do not exceed 140 volts DC or 50 volts rms AC and are certified compliant to FCC Part 15, may be considered in compliance with the electrical safety and radiated emissions requirements and do not require review by the NEBS group.

1.12. Customer Premises Equipment (see Non-CO Buildings, 1.7, B)

AT&T Services requirements for network equipment intended for location in customer premises, that is, all non-central office areas (e.g., data rooms, NOCs, etc.) are contained in Form ESR-003-NCO, and shall include listing by a Nationally Recognized Testing Laboratory. If the equipment is intended ONLY for customer premises locations (NOT COs) listing will be accepted for fire resistance compliance and in some cases listing and FCC electromagnetic certification (e.g. FCC Part 15) may be accepted as verification of conformance to other ATT-TP-76200 **Level 1** requirements.

1.13. Outside Plant Equipment

Requirements for OSP equipment are contained in Form ESR-003-OSP. For questions of test requirements for OSP cabinets and other enclosures contact Duane B. Arnold (817)370-4004, e-mail ba5811@att.com.

1.14. AT&T non-Telco Affiliate Equipment

AT&T non-telco affiliate equipment installed shall, at a minimum, meet ATT-TP-76200 Level 1 (safety) criteria applicable for the location of deployment. ATT-TP-76200 Level 1, 2 or 3 criteria may be desired or required for some affiliate equipment.

1.15. Collocator Equipment

Per FCC Order 99-48, AT&T may verify that Collocator's equipment meets the same safety requirements as equipment that AT&T places in its network. A list of equipment known to be deployed in AT&T's network may be obtained from the All Equipment List (AEL) located on the AT&T extranet site at https://clec.sbc.com/clec/ (this site is available to Collocators who have a working contract with AT&T). Equipment that is already listed on the AEL will not be required to undergo a safety evaluation for compliance to this document*.

Equipment not listed on the AEL must be evaluated for compliance to ATT-TP-76200 Level 1 (safety) requirements or Telcordia SR-3580 Level 1 (safety) requirements*.

NOTE: An ATT-TP-76200 ESP Form must also be provided to allow for network integration. (See Appendix A for an overview of the evaluation process).

*Equipment on the AEL and equipment that has been evaluated as compliant to this requirement must still meet the requirement of being necessary for interconnection and access to UNEs.

1.16. Equipment Testing Requirements

Any alterations to the test protocols given in this document or in referenced test standards documents must be clearly identified in the executive summary and the test results sections of test reports. Testing performed per the Telecommunications Providers Group (TCG) checklist will be acceptable to AT&T. This checklist is available on AT&T's web site at https://ebiznet.sbc.com/sbcnebs/.

1.17. Laboratory Accreditation Requirements

For tests completed after January 1st, 2004, AT&T Services will only accept test reports submitted by testing laboratories that are accredited by an accreditation agency (e.g., the American Association for Laboratory Accreditation, National Voluntary Laboratory Accreditation Program) that is recognized by the National Cooperation for Laboratory Accreditation.

- The scope of accreditation must include the test standards referenced in test reports.
- AT&T Services will accept test reports that include test data generated at non-accredited test laboratories if the tests are witnessed and verified by a representative from a company that operates an accredited test laboratory. Records shall be retained that clearly demonstrate that the individual who witnessed the test has the appropriate expertise and competence. Submitted test reports shall clearly distinguish test data generated in-house at an accredited laboratory from witnessed and verified test data. The test report shall also contain a statement attesting to the compliance of the testing to applicable standards.

- Test laboratories located outside of the United States shall be accredited in accordance with ISO/IEC Guide 25 or ISO/IEC 17025. This accreditation must be performed by a nationally recognized accrediting body operating in accordance with ISO/IEC Guide 58. Testing performed

outside of the United States by a non-accredited laboratory or manufacturer's performed testing may be accepted if witnessed by a U.S. Nationally Recognized Testing Laboratory.

- Each test report submitted to AT&T Services shall contain accreditation and scope information or a letter containing this information may be forwarded for our files.

1.18. Additional AT&T Services Requirements

The following is for notification purposes only. Refer to the directions given to obtain further information on these subjects. Verification of conformance to these subjects is not part of the evaluation process for this section.

Alarms

A. The AT&T Services Alarm Standards Technical Manual, BSP 801-601-900MP, is the official repository of standard alarm information for all network elements (NE) deployed within the AT&T Local Exchange Carriers' (AT&T LEC) network of central offices and remote locations, exclusive of switching equipment. Specifically, this document includes, but is not limited to, concepts and philosophies, interconnect methodologies and alarm details, as related to the alarm monitoring of transmission equipment, loop equipment, power equipment and building or environmental equipment. This document is available to equipment manufacturers which have non-disclosure contracts with AT&T at the AT&T Services Extranet web site. Questions regarding access to this web site should be referred to the vendor's local AT&T Services contacts. All others should reference the requirements for alarms found in Section 4.4 of TP76450.

B. Prior to the installation of any network equipment into an AT&T LEC location, and, as part of the Approval For Use (AFU) process, all such equipment shall be reviewed by the Alarm Standards Committee to ensure that it meets the minimum alarm requirements set forth in the afore mentioned ATT 801-601-900 and/or TP76450.

C. All manufacturers submitting network equipment for review and consideration should pay specific attention to Section 4.4 of TP76450 for minimum alarm and interconnection requirements.

Synchronization

Equipment approved for use in the AT&T LEC network must be compliant to AT&T Services Synchronization standards. These requirements are contained in the AT&T-TP-76450. This document may be obtained from the AT&T Services internet web site at https://ebiznet.sbc.com/sbcnebs/.

Placement and Interconnection Standards

Other AT&T Services physical and functional requirements pertaining to new equipment placement in and connection to AT&T facilities (e.g., dc power, cable routing and connections, etc.) are contained in TP 76450. This document may be obtained from the AT&T Services internet web site at https://ebiznet.sbc.com/sbcnebs/.

1.19. Applicability of Other Publications

All or part of a product's requirements and objectives may be contained in other technical publications for some subjects. Unless otherwise stated in the text of this section all references to other publications are to their most current issue. AT&T requires compliance to Telcordia GR-63-CORE Issue 3 and GR-1089-CORE Issue 4.

1.20. Reasons for Reissue

Changes to Issue 13:

The contents of this section are revised according to business objectives and the evolution of technology. The Reason for Reissue part of this section identifies the changes made to this document when it is revised.

7. DC Power up date
10.2 General up date
12. HSD update
13. Energy Efficiency Testing Standards
FRM Form update
Appendix D. Rohs
Appendix E. Purposed Energy Efficiency requirements

1.21. Effective Date of this Issue

Compliance to new or modified requirements added to this issue of ATT-TP-76200 will be required immediately

1.22. Comments

Comments or questions regarding the content of this section should be directed to:

John Tablerion
Area Manager – Common Systems Equipment Standards Group
15248 Ravinia
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2. ELECTROMAGNETIC COMPATIBILITY

2.1. GR-1089-CORE

The electromagnetic compatibility and electrical safety requirements for equipment products located in Central Offices and Mission Critical Data Rooms are stated in Telcordia publication GR-1089-CORE, Issue 4, June 2006, Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunications Equipment. The electromagnetic compatibility and electrical safety requirements for equipment products located in the outside plant (OSP)., including customer premises are stated in Telcordia publication GR-3108-CORE, Issue 1, July 2004, Generic Requirements for Network Equipment in the Outside Plant

AT&T has adopted GR-1089, Issue 4 with the following exceptions:

AT&T has not adopted Section 4.8, Criteria for Equipment Interfacing With Agreed Primary Protection. Equipment with agreed protection may be considered on a case-by-case basis. However, it is our expectation that equipment be designed to operate with carbon block protectors a described in GR-1089, Section 4.2.1.

For Equipment With Integrated Protection (EIPP), equipment with field serviceable integrated primary protection must be equipped with High Voltage Limiting gas tube protection as specified in GR-974.

Equipment containing primary protection other than a high voltage limiting gas tube will be considered on a case-by-case basis.

2.2. Equipment Type

The product supplier shall determine the Equipment Type and record the appropriate numerical equipment Type in the Y Column of form ESR-001, ESR-002, ESR-003-CO, ESR-003-NCO, ESR-003- OSP or ESR-ANC. To determine the Equipment Type, refer to GR-1089-CORE, Appendix B for all equipment. GR-1089-CORE provides guidelines for applying the aforementioned electromagnetic compatibility requirements. Application of the various criteria is a function of the type of equipment under consideration, its connection to the telecommunications network and the intended location of the equipment.

2.3. Electromagnetic Interference

A. Central Office Equipment shall meet the radiated emission requirements stated in section 3.2 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the radiated emission requirements stated in section 5.2.3 of GR-3108-CORE.

C. Mission Critical Data Room equipment shall meet the applicable radiated emission requirements stated in section 3.2 of GR-1089-CORE (See Form ESR-002).

2.4. Conducted Emissions

A. Central Office Equipment shall meet the conducted emission requirements stated in section 3.2 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the conducted emission requirements stated in section 5.2.3 of GR-3108-CORE.

D. Mission Critical Data Room equipment shall meet the applicable conducted emission requirements stated in section 3.2 of GR-1089-CORE (See Form ESR-002).

2.5. Immunity

A. Central Office Equipment shall meet the immunity requirements stated in section 3.3 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the immunity requirements stated in section 5.2.3 of GR-3108-CORE.

C. Mission Critical Data Room equipment shall meet the applicable immunity requirements stated in section 3.3 of GR-1089-CORE (See Form ESR-002).

2.6. Lightning and AC Power Faults

A. Central Office Equipment shall meet the applicable lightning and ac power fault requirements stated in sections 4 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the applicable lightning and ac power fault requirements stated in section 5.2.4 of GR-3108-CORE. The equipment's Port Type shall be determined using GR-1089, Appendix B.

Outside Plant Equipment placed at a customer premises, such as an ONT or iNID, shall have the electrical ports that interface with CPE defined as follows:

Ethernet or coax – Type 4 for both lightning and AC power fault
POTS – Type 3 for lightning, Type 4 for AC power fault

C. Mission Critical Data Room equipment shall meet the applicable lightning and ac power fault requirements stated in sections 4 of GR-1089-CORE (See Form ESR-002.

2.7. Steady State Power Induction

A. Central Office Equipment shall meet the steady state power induction requirements stated in section 5 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the steady state power induction requirements stated in section 5.2.5 of GR-3108-CORE.

C. Mission Critical Data Room equipment shall meet the applicable steady state power induction requirements stated in sections 5 of GR-1089-CORE (See Form ESR-002.

2.8. Electrical Safety Criteria

A. Central Office Equipment shall meet the electrical safety requirements stated in section 7 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the steady state power induction requirements stated in section 5.2.7 of GR-3108-CORE.

C. Mission Critical Data Room equipment shall meet the applicable electrical safety requirements stated in sections 7 of GR-1089-CORE (See Form ESR-002.

2.9. DC Potential Difference

A. Central Office Equipment shall meet the dc potential difference requirements stated in section 6 of GR-1089-CORE.

B. Outside Plant Equipment shall meet the dc potential difference requirements stated in section 5.2.6 of GR-3108-CORE.

3. ACOUSTIC NOISE

A. Central Office, CEVs, Huts and Customer Premises equipment shall meet the acoustic noise requirements stated in section 4.6 of GR-63-CORE, Issue 3.

B. OSP Class 2 & 3 equipment shall conform to Section 3.29 of GR-487-CORE when installed in cabinets.

4. ELECTROSTATIC DISCHARGE (ESD) and ELECTRICAL FAST TRANSIENTS (EFT)

A. Equipment deployed in the Central Office and Outside Plant shall meet the requirements in this section.

B. Equipment deployed in a Mission Critical Data Room shall meet the applicable Electrostatic Discharge requirements stated in section 2 of GR-1089-CORE, ISSUE 4 (See Form ESR-002).

4.1. ESD Immunity Criteria

Equipment shall meet the ESD immunity criteria requirements for normal operation and be tested for installation and repair objectives according to section 2.1.2 (ESD Immunity Criteria) of Telcordia's GR-1089-CORE, ISSUE 4 document. All tests shall be conducted as described in section 2.1.4 of GR-1089 and IEC Publication 61000-4-2.

4.2. Special Requirements and Maintenance Information

Any additional equipment-specific requirements in paragraph 2.1.2.4 of GR-1089-CORE, ISSUE 4 shall be described in the report.

4.3. Electrical Fast Transient (EFT)

A. Equipment shall be tested in accordance with section 2.2 of Telcordia's GR-1089-CORE, ISSUE 4 document with tests conducted as described in section 2.2.1.

B. Equipment deployed in a Mission Critical Data Room shall meet the applicable Electrical Fast Transient requirements stated in section 2.2 of GR-1089-CORE, ISSUE 4 (See Form ESR-002).

5. GROUNDING

A. Equipment deployed in the central office and Outside Plant shall meet the requirements in this section.

B. Equipment deployed in a Mission Critical Data Room shall meet the applicable Grounding requirements stated in section 9 of GR-1089-CORE, ISSUE 4 (See Form ESR-002).

5.1. Bonding and Grounding Requirements

Structures, equipment and power systems submitted for evaluation shall meet applicable Bonding and Grounding requirements of section 9 of GR-1089-CORE, Issue 4. . For Ancillary reviews, only the short circuit test data of section 9.10 is required.

6. THERMAL

6.1. Temperature and Humidity Requirements

A. Indoor Thermal Environments

Network equipment located in structures with a controlled environment (central offices, huts, CEVs, etc.) must conform to requirements in Section 4.1 of GR-63-CORE, Issue 3.

B. Protected Outdoor Thermal Environments

Equipment intended for deployment in enclosures with an uncontrolled environment (e.g. remote cabinets without active temperature controls) must conform to:

1. Requirements in Sections 4.2 through 4.5 of Telcordia GR-3108-CORE.

   NOTE: Equipment that requires internal fan-cooling must conform to these requirements during short-term temperature excursions associated with fan failure (GR-3109, Sec 1.5). To demonstrate compliance, the last cycle (Steps 11 through 14) of the Temperature and Humidity Cycling Test described in Sec 4.5 of GR-3108 must be repeated with one fan disabled.

2. Requirements in Section 4.8 of Telcordia GR-418-CORE, Issue 2 with the following exceptions, revisions and additions:

   a. The test configuration must be agreed to by AT&T before start of test.
   b. During test, key parameters shall be monitored per Telcordia GR applicable to the specific technology under test and/or vendor specifications.
   c. Objective 04-76 is a requirement.
   d. Objective 04-77 is a requirement.
   e. Ramp rate fro requirement R4-78 shall be 35C/hr:
   f. Objective O4-79 is not accepted by AT&T.
   g. Requirement R4-80 is not accepted by AT&T.
   h. Requirement R4-99: Section referenced in parenthesis shall be Section 4.8.4, not 4.4 (corrects typographical error in GR)..
   i. Requirement R4-100: Equipment shall run alarm free throughout test.
   j. Objective 04-102 is a requirement.

C. Unprotected Outdoor Thermal Environment

Electronic equipment that is mounted and deployed as an integral part of an OSP enclosure shall be tested as a unit with enclosure and electronics configured as intended for deployment. The equipment must conform to:

1. Requirements in Telcordia GR-3108-CORE, Sections 4.2 through 4.5.

Note: the test methodology of Section 4.5 shall be revised so that the high temperature setting of 65^{o}C (149^{o}F) is adjusted to be 46^{o}C (115^{o}F) plus solar loading. Solar loading shall be calculated per GR-487-CORE, Section 3.26.

2. Requirements in Section 4.8 of Telcordia GR-418-CORE, Issue 2 with the following exceptions, revisions and additions:

a. The test configuration must be agreed to by AT&T before start of test.
b. During test, key parameters shall be monitored per Telcordia GR applicable to the specific technology under test and/or vendor specifications.
c. Objective 04-76 is a requirement.
d. Objective 04-77 is a requirement.
e. Ramp rate fro requirement R4-78 shall be 35C/hr:
f. Objective O4-79 is not accepted by AT&T.
g. Requirement R4-80 is not accepted by AT&T.
h. Requirement R4-99: Section referenced in parenthesis shall be Section 4.8.4, not 4.4 (corrects typographical error in GR)..
i. Requirement R4-100: Equipment shall run alarm free throughout test.
j. Objective 04-102 is a requirement.

D. Mission Critical Data Room Thermal Environments

Equipment intended for deployment in Mission Critical Data Rooms must be tested to Operating Conditions for criteria [72, 73] in Telcordia GR-63-CORE, ISSUE 3.

NOTE: Requirements other than those contained in this document may apply to auxiliary hardware used in an uncontrolled environment including power supplies and batteries.

6.2. Altitude

A. Central Office Equipment shall meet the altitude requirements and objective stated in section 4.1.3 of Telcordia publication GR-63-CORE, Issue 3.

B Outside Plant Equipment shall meet the altitude requirements and objective stated in section 6.3 of Telcordia publication GR-3108-CORE.

C. Not applicable to Mission Critical Data Room Equipment.

6.3. Heat Dissipation

A. Central Office Equipment

1) The normal continuous duty heat dissipated (in Watts) by the equipment shall be stated on ATT-TP-76200 form ESP-001 or ESP-002 form for individual units and maximum configured systems, if applicable. Heat dissipation is usually considered the power draw by equipment minus work accomplished by equipment and the value can be calculated or measured by the manufacturer. Manufacturer shall refer to Telcordia GR-3028 Section 6. Equipment Specifications for determining heat dissipation data for products and information reported as required under equipment data reporting. ATT-TP-76200 Form ESP-001 or ESP-002 is to be used for reporting to AT&T Services in place of form referred to in GR-3028 Appendix F.
2) Manufacturer shall state **Yes** for item 6.3B (2) on Form ESR-002 if product is electric motor fan forced cooled or **No** if product is convection cooled or cooled by other than fan forced cooling design. Other cooling methods shall be explained with a statement included as attachment to form ESP-001/002.
3) Equipment cooling scheme in central offices typically has cooling air inlet in front face of equipment and heat exhaust to back or top of equipment, per GR-3028 EC Cooling Class F1-R3. The equipment cooling class with bottom-front inlet air to rear-top exhaust shall be AT&T Services' preferred configuration for all fan forced cooled products*. Manufacturer shall state **Yes** for item 6.3B (3) on Form ESR-002 if cooling air flow of your product adheres to this cooling scheme. Heat exhaust to side(s) or front of equipment either as primary or secondary paths requires answering this question with a **No**.

*NOTE: *Equipment cooling airflow designs other than front to rear/top will be considered by AT&T* Services*; however, those products will be considered on a case by case basis and may require deployment restrictions or equipment revisions prior to deployment.*

4) Equipment surfaces that face aisle or where normal maintenance functions are performed shall comply with requirements stated in R4-22 of paragraph 4.1.7 Surface Temperature. All equipment surfaces that personnel may be exposed to shall be within limits shown in Table 4-6. For equipment that has demonstrated conformance to the Surface Temperature requirements manufacturer shall state **YES** for item 6.3B (4) on form ESR-002. If equipment has not been tested or does not conform, manufacturer shall state **NO.**

Table 4-6
(From Telcordia GR-63)

Materials	Permitted Temperature (℃) as a Function of Exposure Time	
	Unintentional Contact or Parts Held for Short Periods in Normal Use	Prolonged Use
Metals	55	48
Nonmetals	70	48

B. Outside Plant Equipment – Class 1, 2, & 3 Environments

The OSP equipment heat dissipation data described in GR-3108, Section 4.1 shall be reported on ATT-TP-76200 Forms ESP-001 or ESP-002.

C. Outside Plant Equipment – Unprotected Environment

D. Mission Critical Data Room Equipment

1) The normal continuous duty heat dissipated (in Watts) by the equipment shall be stated on ATT-TP-76200 form ESP-001 or ESP-002 for individual units and maximum configured systems, if applicable. Heat dissipation is usually considered the power draw by equipment minus work accomplished by equipment and the value can be calculated or measured by the manufacturer. Manufacturer shall refer to Telcordia GR-3028 Section 6. Equipment Specifications for determining heat dissipation data for products and information reported as required under equipment data reporting. ATT-TP-76200 Form ESP-001 or ESP-002 is to be used for reporting to AT&T Services in place of form referred to in GR-3028 Appendix F.
2) Manufacturer shall state **Yes** for item 6.3B (2) on Form ESR-002 if product is electric motor fan forced cooled or **No** if product is convection cooled or cooled by other than fan forced cooling design. Other cooling methods shall be explained with a statement included as attachment to form ESP-001/002.
3) Equipment cooling scheme in Data Rooms typically has cooling air inlet from raised floor tiles in front of or underneath equipment and heat exhaust to back or top of equipment, per GR-3028 EC Cooling Class F1-R3 or B-T. The equipment cooling class with bottom-front inlet air to rear-top exhaust shall be AT&T Services' preferred configuration for all fan forced cooled products*. Manufacturer shall state **Yes** for item 6.3B (3) on Form ESR-002 if cooling air flow of your product adheres to this cooling scheme. Heat exhaust to side(s) or front of equipment either as primary or secondary paths requires answering this question with a **No**.
4) Same face temperature requirements as stated in TP76200 6.3 Heat Dissipation Central Office Equipment paragraph 4).

*NOTE: *Equipment cooling airflow designs other than front to rear/top will be considered by AT&T* Services*; however, those products will be considered on a case by case basis and may require deployment restrictions or equipment revisions prior to deployment.*

7. DC POWER

The following requirements are referenced from, but not limited to, the most recent ATIS-PP-0600315.2007. Test reports showing conformance to all objectives in GR-1089-CORE Section 10 will be accepted as demonstrating conformance to respective requirements in 7.1 through 7.9 of this Section (ATT-TP-76200 Section 7) Section 7.10 and 7.11 are required in addition to the GR requirements for equipment intended to be installed in a dual power plant environment as previously required by AT&T NEDS and now covered by this standard.

A. All network equipment deployed in Central Offices and Outside Plant shall be DC powered and meet the requirements in this section.

B. DC powered equipment deployed in a Mission Critical Data Room shall meet the applicable Power requirements in this section.

C. The requirements in this section are for nominal -48 VDC Network Elements operating in a steady state voltage range of -40 VDC to 56.7 VDC per Table 1 of ANSI T1.315.

NOTE: AT&T Services may have other DC Power requirements including but not limited to those referenced in ATT -TP-76450, Telcordia's GR-499-Core and GR-513-Core.

Unless otherwise stated, all requirements shall apply to the dc power input terminals of the telecommunications load equipment. Although systems vary in architecture, all tests in this standard shall be performed with the minimum number of power supply modules installed in the system that can be utilized in practice (except for the noise return tests). For instance if a system has a redundant power supply module(s), all the redundant supply modules shall be disabled or removed during the tests in this standard (unless they physically cannot be removed or disabled when the equipment is deployed). In addition, for systems with multiple feeds such as "A" and "B", power is only supplied to one feed during the tests in this standard.

7.1. Steady-State Input DC Voltage Requirements

The telecommunications load equipment shall meet its operational requirements at any input voltage of the correct polarity between and including the minimum and maximum values specified in Tables 1 in ANSI T1.315.

7.2. Undervoltage Requirements

Equipment shall operate properly when exposed to steady state undervoltage conditions and shall comply with the conformance criteria as described in ANSI T1.315. The equipment supplier shall provide a report containing the test methods and results for the above requirement.

7.3. Minimum Operating Voltage

Specify the minimum voltage at which the equipment remains fully operational and verify the equipment will recover to a fully operational state after losing power.

7.4. Minimum Operating Voltage Cutoff and Recovery for Nominal -48VDC Equipment

This is an objective for AT&T. It is a strong preference that equipment meet this objective. Equipment that does not meet this objective may require mitigation measures when deployed in some AT&T networks.

Nominal -48VDC equipment shall be equipped with a mechanism (software or hardware) that de-powers the equipment, or substantially reduces power utilized by the equipment (less than 20% compared to nominal power at -48VDC), if the voltage at the input terminals of the equipment drops below -38.5VDC (±1.0 volt) for more than 10 seconds. The equipment shall remain in this de-powered or reduced power state until the voltage returns to at least -45VDC (±3.0 volts). If the voltage drops to between 0 and -20VDC for less than 20mS it is permissible to recover at any voltage greater than -38.5VDC (±1.0 volt). The equipment shall not be permanently damaged or permanently have its performance degraded as a result of de-powering and recovery. The equipment shall recover to normal operation within 30 minutes without manual intervention by service personnel. Equipment software/firmware provisioning shall not be changed or lost as a result of applying voltages below the minimum specified in Table 1. The equipment shall also not cause a recommended fuse or circuit breaker to operate.

The Equipment shall be tested and the results recorded in a test report .

7.5. Current Drains

A. The List 1 current drain, for a maximum configuration of cards and shelves, shall be provided in amperes on the appropriate ESP form. List 1 drain is the average busy-hour current at normal voltage and operating conditions.

B. The List 2 current drain, for a maximum configuration of cards and shelves, shall be provided in amperes on the appropriate ESP form. List 2 drain is the peak current during emergency operating limits of the EUT and with normal operating conditions (no short circuits or other malfunctions).

7.6. Overvoltage Requirements

Telecommunications load equipment shall not be permanently damaged or permanently have its performance degraded when an input voltage of correct polarity, with a value between 0 V and the maximum voltage level for each nominal voltage plant specified in Tables 1 of ANSI T1.315 is applied for any period of time.

Equipment shall operate properly when exposed to steady state overvoltage conditions, shall comply with the conformance and test results shall be recorded in a test report as described in ANSI T1.315.

7.7. Overvoltage Transient Requirement

Equipment shall operate properly when exposed to an overvoltage transient condition , shall comply with the conformance criteria and test results shall be recorded in a test report as described in ANSI T1.315.

7.8. Protective Device Operation Transient

Equipment shall operate properly when exposed to transient conditions, shall comply with the conformance criteria and test results shall be recorded in a test report as described in ANSI T1.315. Testing methods shall be utilized to ensure prevention of malfunction or damage.

7.9. Electrical Noise Requirements

7.9.1 Noise immunity

Equipment shall operate properly when exposed to electrical noise, shall comply with the conformance criteria and test results shall be recorded in a test report as described in ANSI T1.315.

7.9.2 Noise returned by the telecommunications load equipment

Equipment shall not return excessive noise onto the DC power system, the equipment shall comply with the conformance criteria and test results shall be recorded in a test report as described in ANSI T1.315.

7.10. Dual Power Source for AT&T Corp, Inc

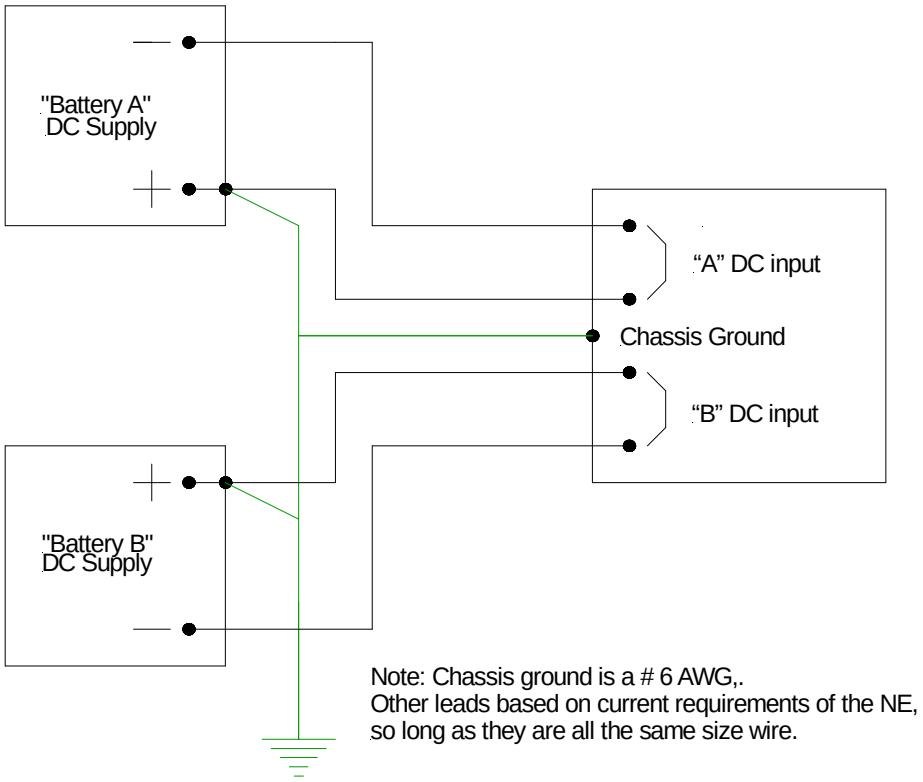
If the Network Element will be installed in an environment powered by redundant independent battery power plants providing –48 VDC (nominal) it will be necessary to perform the test procedure in Section 7.11. The Network Element shall be:

- Powered by a steady state –48 volt (nominal) DC power source
- Able to operate between -40 VDC to 56.7 VDC measured at the Network Element unit input power lugs for each individual power source feed.
- Able to accept dual, independent –48 VDC nominal power sources
- Able to accept distribution leads which are connected via AT&T approved power connectors.

In the event that one of the power sources is unavailable, the equipment shall continue to operate from the remaining power source without manual intervention and without interruption of service or functionality (including all LED's, alarms, and indications).

7.11. Procedure to test for Dual Power Plant Operation

Figure 7-8
Test Set Up for Dual Power Plant Operation Test



A. Static test

With the EUT not connected to a power source use a Volt-Ohm meter to measure the resistance between the two battery returns. Record the reading. Reverse the leads and record the second reading.

1. If the resistance is less than 100K ohms, the unit can not be used on Dual Power Plants. It must be certified for Single Power Plant operation.
2. If the resistance is greater than 100K ohms proceed with the operational section of the test.

B. Operational test (-48 equipment)

Power the EUT using two independent DC sources variable from 40 volts to 60 DC volts. See figure 1 for test set up.

1. While maintaining -50 volts on the “A” input to the EUT, lower the voltage on the “B” to -40 volts. Leave the EUT in this condition for 30 minutes.
   Note: If the EUT will not operate to -40 volts DC, test at .5 volt above the low voltage cutoff point of the EUT.
2. Measure the DC current on all five wires at the end of the 30 minutes period and record.
3. Shut down the DC power supplies and inspect the EUT for any signs of physical damage.
4. Reapply power (-50 volts) to both inputs and verify proper operation of the EUT.
5. Reduce voltage on the “A” side to -40 VDC and leave the “B” side at -50 volts DC. Leave in this condition for 30 minutes.
6. Measure DC current on all five wires at the end of the 30 minutes and record.
7. Return the “A” side and verify proper operation of the EUT.
8. Shut down the DC power supplies and inspect the EUT for any signs of physical damage.
9. Review the DC current readings for the battery and battery return leads. If all are within 5% of the average of the reading and there is no physical damage to the EUT, the EUT can be certified as working on Dual Power Plants.
10. Review measurements on ground lead and report any reading over 5% of the total current provided.

C. Current Drains

Current Drain information shall be provided to outline current draws in both normal and worst case voltage scenarios. (The latter information shall also address impacts of failed feeds and temperature where variable speed fans or any other operating conditions make such considerations appropriate). When multiple configurations are possible because of card variety, test data on several “generic” configurations shall be provided with a table of power numbers to help the user interpolate the approximate values of other configurations.

D. Network Element, Shelf or Circuit Pack Power

Each element/shelf/circuit pack, whichever is the smallest independent load device of the Network Element, shall obtain power from two completely independent power units. Furthermore, the return path from the power units shall remain completely independent.

If one of the power units fails, an alarm shall be generated and the load shall be carried by the other unit without manual intervention and without interruption of service or functionality. The other power unit shall support the operation of the element/shelf/circuit pack until the problem with the faulty unit is corrected.

E. OR-ing Diodes

The use of “OR-ing” diodes to combine power feeders may be used to power a network element from two power sources provided all the following requirements are met:

a) Appropriately sized over-current protection devices shall be present in each power path to the unit, within the network element.

b) Diodes shall also be included in each power path return of the unit.

c) The maximum steady state current to be handled by the diode shall be limited to 50% of the diode’s maximum steady state current rating.

d) Current transients shall not exceed the maximum rated value for the diode.

e) The maximum reverse voltage across the diode shall be limited to 70% of the diode’s peak inverse voltage rating.

H. Low Input Voltage Recovery

Network Elements must be able to automatically recover from the low input voltage shutdown through a controlled restart process. The restart shall occur when the voltage measured at the input terminals of the equipment frame is -45VDC (±3.0 volts). for equipment deployed in central office environments and regenerator or other remote locations containing largely similar equipment, The NE shall return to normal operation (based on its current configuration data) without manual intervention, and without causing any overcurrent protection devices to operate.

8. AIRBORNE CONTAMINANTS

8.1. Controlled Environments

Equipment intended for installation in controlled environment spaces shall meet the Airborne Contaminants requirements for indoor equipment as stated in section 4.5 of GR-63-CORE, Issue 3.

A. Central Office Equipment shall conform to the MFG test performed for 14 days as detailed in Telcordia GR-63, Issue 3.

B. Mission Critical Data Room Equipment shall conform to the MFG test performed for 10 days as detailed in Telcordia GR-63, Issue 3.

8.2. Uncontrolled Environments (OSP)

Equipment intended for use in outdoor air environments (i.e., cabinets installed on pads or poles) with no filtration

A. Shall meet the Airborne Contaminants requirements for outdoor equipment as stated GR-3108-CORE, Section 6.4. The MFG test shall be performed for 14 days for all environmental class locations.

B. Class 3 Equipment shall meet the Salt Fog Exposure requirements of GR-3108-CORE, Section 6.1.

8.3. Fan Filter Requirements

A. **Central Office Equipment**, except for power source equipment (e.g. rectifiers, etc.) shall conform to the fan filter requirements contained in GR-63_CORE, Issue 3.

B. **Mission Critical Data Room Equipment** shall conform to the fan filter requirements contained in GR-63_CORE, Issue 3.

C. **OSP Equipment** shall not require or be deployed with filters and conformance to fan filter standards is not required.

D. GR-63-CORE, Issue 3, Objective O4-94 for fan filter alarms shall be a requirement.

9. SHOCK AND VIBRATION

Central Office and Outside Plant Equipment shall conform to the requirements in this section except where specified differently. Mission Critical Data Room equipment shall conform to requirements in this section when so specified.

9.1. Handling and Transportation - Shock

Network equipment shall be designed with tolerance for shock of transportation and handling from manufacturer's facilities to job sites without sustaining physical damage or affecting functional performance.

A. Central Office and Mission Critical Data Room Equipment

The manufacturer shall be in compliance to handling and transportation shock requirements specified in Telcordia document GR-63-CORE, ISSUE 3. Product test documentation may not be requested with the understanding that the equipment manufacturer is responsible to assure receipt of acceptable and functional products to the job sites.

B. Outside Plant Equipment

1. The manufacturer shall be in compliance to transportation vibration requirements specified in Telcordia document 3108-CORE, Section 2.10.

2. OSP equipment that weighs 220 lbs (100 kgs) or less shall conform to the Drop Test requirements in Section 5.4 of GR-950-CORE. As an objective, this equipment should conform to the Drop Test requirements in Section 4.2 of GR- 2834-CORE.

9.2. Handling and Transportation - Vibration

Network equipment shall be designed with tolerance for transportation and handling from manufacturer's facilities to the job site without sustaining physical damage or affecting functional performance. The manufacturer shall state **Yes** if in compliance to handling and transportation vibration requirements specified in Telcordia document GR-63, **No** if not in compliance or if product has not been tested. AT&T Services may not request test documentation with the understanding that the equipment manufacturer is responsible to assure receipt of an acceptable and functional product to the AT&T job site.

9.3. Earthquake

A. Central Office and Outside Plant Equipment

Equipment may be deployed in high earthquake risk areas. Network equipment considered for AT&T Level 3 service shall be designed for service in high seismic risk locations. Equipment shall demonstrate conformance to Telcordia GR-63-CORE, ISSUE 3or ANSI T1-329 earthquake requirements by having equipment assembly tested on shake table and submitting documentation of successful test results. The manufacturer shall state **Yes** if in compliance to earthquake requirements specified in Telcordia document GR-63-CORE or ANSI T1-329, No if not in compliance or if product has not been tested. Manufacturer may state N/A for products that are intended for *low seismic risk applications only* and has written statement from AT&T Services confirming the limited application. Equipment considered for Level 1 service does not require earthquake tests to be conducted; however, equipment shall be installed in framework suitable for resisting earthquake loads and framework secured appropriately to building. Network equipment intended for outside plant

applications and designed in accordance to GR-3108 will be in conformance following requirements of central office equipment.

B. Mission Critical Data Room Equipment

Equipment shall demonstrate conformance to Telcordia GR-63-CORE, ISSUE 3 or ANSI T1-329 earthquake requirements for Zone 4 if deployed in a Zone 4 area or Zone 2 if not in Zone 4 area by having equipment assembly tested on shake table and submitting documentation of successful test results. The manufacturer shall state **Yes** if in compliance to earthquake requirements specified in Telcordia document GR-63-CORE, ISSUE 3 or ANSI T1-329

NOTE: All equipment placed on an access floor system shall be secured against overturning, lateral displacement and pounding into adjacent equipment with securing methods that restrain the equipment back to the building structure. The equipment shall not be secured to the access floor system as the primary means for restraint of the equipment unless the floor system has been designed and constructed to accept the equipment loads along with the normal floor loads. Access floor systems not designed to restrain equipment frames shall not be modified, adapted or otherwise reconfigured to secure equipment since it will be unlikely that floor components will handle the added equipment loads. Access floor systems installed in an environment where network

services will be provided must be designed for greater vertical and lateral loading capabilities. Floor panel shall be minimum 1500 pound rating. Overturning moment capabilities on pedestals shall be greater than 170 pounds applied to a 24" height pedestal pulled horizontally at the head of the pedestal.

In "High Seismic Risk" sites, the equipment frames shall be designed to be restrained for up to 1.6G lateral acceleration at the building floor level. Access floor systems will likely amplify the ground accelerations and it will be difficult to predict the ground accelerations at the access floor panel. The ultimate ground acceleration will therefore be assumed to be 1.6 G at the top of the access floor and net affect of floor will not be considered for floor systems possessing lateral capabilities described previously. In "Low Seismic Risk" sites, the equipment frames shall be designed to be restrained for .75G lateral acceleration at the building floor level.

Network equipment conforming to Telcordia GR-63 Earthquake requirements were tested and confirmed to be in compliance based on building floor installations. The conforming equipment installed on an access floors may subject the equipment to conditions that were not evaluated and service reliability of those products may be reduced with the new conditions. These risks can be mitigated if the securing methods for the equipment framework limit frame displacement and if access floor does not contribute additional loads onto equipment frames.

9.4. Positive Latching

All network equipment shall have circuit pack latches or retainers to prevent pack and module walkout. Ejectors are not retainers and should not be used for that purpose.

9.5. Hard Drive Backup

Hard drive storage units used with network equipment shall be designed with tolerance for shock and vibration by physical isolation of drives, backup systems or self-recovery capabilities to assure service integrity.

9.6. Standard Frame

Network equipment shall be designed for mounting in telecommunications industry standard framework, relay racks. However, equipment deeper than 12 inches, heavier than 400 pounds or designed for special housings may require framework other than standard relay racks. For safety consideration, a loaded framework during transport or on site awaiting installation should temporarily be able to stand upright on its own when not secured. If weight distribution of equipment in framework results in framework falling backward or forward, special deeper framework is to be provided.

9.7. Self Support Frame

All network equipment assemblies 7'-0" tall and under shall be designed for freestanding installation in AT&T equipment areas. Freestanding is defined as framework not secured overhead but with provisions for floor anchors of appropriate size and quantity to secure equipment from overturning under worst-case site conditions.

9.8. Office Vibrations

A. Central Office and Mission Critical Data Room

Network equipment shall be designed for operation under office vibration conditions specified in Telcordia document GR-63-CORE, ISSUE 3. The manufacturer shall state Yes if in compliance to office vibration requirements in Telcordia document GR-63-CORE, **No** if not in compliance or if product has not been tested. AT&T Services may not request test documentation with the understanding that the equipment manufacturer is responsible to assure operational reliability for conditions that may exist in AT&T equipment locations***.***

B. Outside Plant

Network equipment intended for outside plant applications shall be designed and tested in accordance to Telcordia GR-3108 paragraph 6.2.2. Low Level Vibration Resistance test procedures. The low level vibration resistance tests differ from GR-63-CORE, ISSUE 3 tests, instead GR-3108 follows ETSI EN 300 019 1-4 V2.1.2 (2003-4) test standards. The manufacturer shall state **Yes** for item 9.8B on Form ESR-002 if in compliance to low level test requirements of GR-3108, **No** if not in compliance or if product has not been tested.

9.9. Floor Loading

Floor loading requirements specified in Telcordia document GR-63-CORE, ISSUE 3 shall not be exceeded. The manufacturer shall consider the worst case configuration of heaviest arrangement within a single framework when analyzing floor load. The configuration may need to include weight within a frame contributed from equipment supplied by others. Manufacturer shall state **Yes** if product is in conformance to floor load limits.

10. FIRE RESISTANCE

A. Central Office and Outside Plant Equipment shall conform to the requirements of this section with the exception that listed equipment installed exclusively at non-CO locations may be exempt.

10.1. Minimum Fire Resistance

This part provides the minimum fire resistance requirements for equipment products and apparatus intended for installation in the network equipment facilities. All equipment shall be tested or otherwise evaluated for compliance with the fire resistance criteria provided in this part.

10.2. General

Generally, products that have been determined to be acceptable for purchase from a fire resistance perspective do not have to be retested or evaluated unless subsequent changes to the product include one or more of the following characteristics:

- An increase in the product's polymeric content (fuel load),
- A decrease in the fire resistance characteristic/rating of included components,
- An increase in the density of installed electrical components, or
- A physical change in the product’s framework or enclosure construction.

Full compliance of the requirements in this document do not apply to auxiliary monitoring equipment such as oscilloscopes, personal computers, portable test equipment, etc., which are not integral to the equipment. However, such auxiliary equipment must have either UL listing or be ANSI T1.307 compliant.

10.3. Materials/Components

The materials and components used in the construction and interconnection of equipment shall comply with the most current issue of ANSI/T1-307. Generally, materials and components shall be constructed of polymeric materials having an oxygen index of 28% or greater and a fire resistance characteristic equivalent to or better than Under Writers Laboratories (UL) standard UL 94 V-1. Cable and wire shall generally be listed for their purpose.

10.4. Protective Barriers

Exposed nonmetallic equipment frame components such as protective covers, viewing panels, etc. shall comply with the ancillary materials requirements of ANSI/T1.307-2003 or later.

10.5. Fire Spread

A. Central Office equipment shall comply with the appropriate fire spread performance criteria provided in Telcordia GR-63-CORE, Issue 3. .

Equipment suppliers shall use appropriate ESR forms to indicate whether the product(s) under consideration have been evaluated to the criteria of GR-63-CORE Issue 3 and whether a copy of the test report and test video issued by the testing facility is included for review and retention. An expected test date shall be given for all products that have not yet been evaluated to the above criteria.

B. Mission Critical Data Room Equipment shall be listed by a Nationally Recognized Testing Laboratory (NRTL)

C. OSP equipment for Class 2 and 3 environments shall comply with the fire resistance criteria of Telcordia GR-3108-CORE, Section 6.5.

11. SPATIAL

A. Equipment installed in CO, Huts and CEVs shall meet the following requirements.

11.1. General

This part provides the physical requirements for equipment units, and equipment systems intended for use in indoor network equipment areas. This part does not apply to power equipment or office distributing frames, and is not applicable to equipment intended solely for use in outdoor equipment enclosures, or controlled environment vaults. The equipment covered would typically be rack mounted in two or four post framework intended for environmentally controlled environments. The equipment framework if provided by the equipment manufacturer shall be approved by AT&T and in conformance to AT&T performance and dimensional requirements.

Form ESP-1 and/or ESP-2, physical data and engineering data shall be completed to include dimensional and weight data on equipment covered in this section. ESR-3-CO form, box 11.4, 11.5, 11.6 and 11.7 shall be checked Y, N or N/A as applicable on conformance to following paragraphs.

11.2. Equipment System

The word **system** as used in this part refers to multi-unit and multi-frame equipment configurations that collectively perform one or more telecommunications or data management functions. System equipment is normally furnished preinstalled in one or more equipment framework assemblies.

11.3. Equipment Unit

The term equipment **unit** as used in this part refers to stand alone products that are generally field mounted by equipment users. An equipment unit may also be known as a shelf, cardcage, chassis or apparatus as defined in ATIS documents. The unit will basically be a mechanical structure designed specifically to support associated electrical and electronic components. The unit shall be designed for vertical rack mounted in two or four post frameworks of industry standard widths.

11.4. Framework and Equipment Requirements

Equipment and framework intended for legacy environments of two post framework lineups:

A. Framework shall be designed for freestanding configuration not requiring overhead support with maximum height of 7'-0". Framework base shall have provisions for floor anchoring of anchor hardware up to 18mm diameter and capabilities for repositioning anchors at minimum of 1" to avoid rebar. AT&T requirements require all framework to be designed and tested for Zone 4 service.

B. Equipment unit shall be designed for 23" or 19" nominal width mounting and fit within uprights of a standard 23" width framework. Where 19" equipment is provided, mounting adapters shall be provided for installation in 23" width framework. (limited applications of 19" nominal width framework are used and, if designated, equipment shall be designed to fit within 17-1/4" clearance between frame uprights.)

C. Framework should not exceed 2'-6" in overall width.

D. In legacy transport environments equipment and framework should not exceed 15" in depth when adding to existing lineups.

E. In newer technology lineups equipment and framework shall not exceed 24" in depth

F. Should not require more than 2' 6" of aisle space at the rear and 3' 0" of aisle space at the front for equipment installation and maintenance purposes.

G. Where product requires additional cabling space adjacent to equipment framework, designate on form ESP-1 and/or ESP-2 under Engineering Data, Additional Space Requirements.

Equipment intended for four post framework installation lineups:

A. Framework shall be designed for freestanding configuration not requiring overhead support with maximum height of 7'-0". Framework base shall have provisions for floor anchoring of anchor hardware up to 18mm diameter and capabilities for repositioning anchors at minimum of 1" to avoid rebar. AT&T requirements require all framework to be designed and tested for Zone 4 service.

B. Equipment unit shall be designed for 23" or 19" nominal width mounting and fit within uprights of a standard 23" width framework. Where 19" equipment is provided, mounting adapters shall be provided for installation in 23" width mounting rail configuration.

C. Framework width shall be designed for maximum 30" width.

D. Framework depth shall be designed for 24" to 36" depth.

E. Doors, slide drawers should not require more than 30 inches space into aisles to use.

F. Four post framework shall allow for room ventilation air to freely enter and exit enclosure. Doors, side panels and top panels shall be designed for air flow if provided.

11.5. Equipment Floor Loading

An individual framework loaded with equipment shall be designed and constructed to floor load requirements of less than 560 kg/m^2 (114.7 lb./ft^2) The floor loading for an equipment framework is calculated by dividing the frame weight by the area of a rectangle bounded by the extended frame sides and half of the front (3 ft -0 in. or 18 in) and half of the rear (2 ft.-6 in. or 15 in.) aisles. The standard framework footprint to be used in AT&T calculations would be 26 in. wide and 24" deep. For four post frameworks use footprint dimension of framework and same front and rear aisle dimensions. Total weight of equipment should include all cables that may be required in normal field installation.

11.6. Equipment Units

Equipment units:

A. Shall be designed so they are installed from the front and cabled from the rear of equipment framework assemblies,

B. Shall incorporate the use of holes or closed slots in mounting hardware for attachment to equipment framework mounting surfaces, and be designed for 23" nominal width framework,

C. Shall accommodate mounting in equipment frameworks using the 1-3/4 x 23 inch mounting hole pattern shown in Figure 11-1, and

D. Limited applications of products that will not permit rear access will require that equipment be designed strictly for front access where cabling, maintenance and normal service be performed from front only. These products shall be designed for front access and indicated on form **ESP-1** and/or **ESP-2** , **Engineering Data**, **Equipment Locating Restrictions** as **YES**, "**Front Access Only**" Only those products intended for limited applications such as CEV installations, ETSI compliant products or other AT&T authorized use shall be designed for front access.

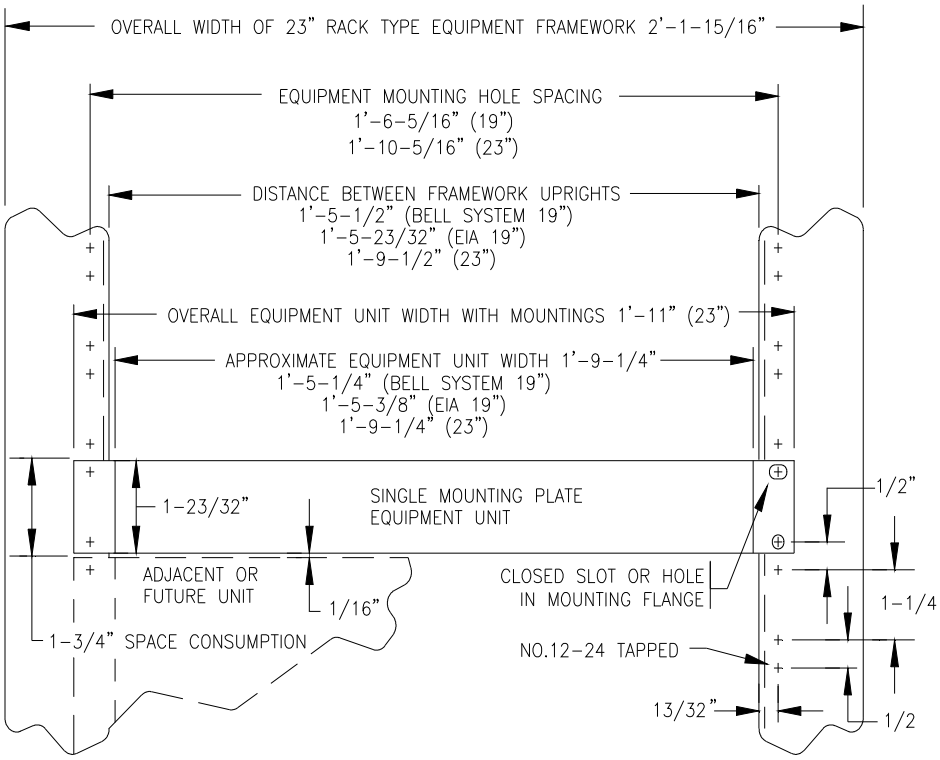


Figure 11 -1 - Commonly Referenced Equipment Spatial Considerations

B. Equipment installed in CO, Huts and CEVs shall meet the following requirements.

11.7. OSP Electronics

Equipment installed in OSP shall meet the spatial requirements of Telcordia GR-3108-CORE, Section 3.

12. PHYSICAL DESIGN AND MANUFACTURING REQUIREMENTS

12.1. Physical Design and Manufacturing

A. CO and OSP electronic assemblies should meet the physical design and manufacturing requirements of Telcordia GR-78-CORE. If these requirements are not met, supplier shall mark **"NO"** on the appropriate ESR form and attach documentation detailing which requirements are not met and why they are not met.

B. OSP electronic assemblies shall meet the physical design requirements of the most recent issue of Telcordia GR-3108-CORE, Section 2.

12.2. Environmental Hazards

Requirements in this section are intended to identify hazardous materials as defined by the regulatory agencies (USEPA, US OSHA, state and local regulatory bodies and European Union) and assess the equipment under review's compliance to the European Union Restriction of Hazardous Substances (RoHS)[1]. This standard applies to electrical and electronics products, including, but not limited to, IT and telecommunications equipment, consumer equipment, lighting equipment, electrical and electronic tools, sold to AT&T.

A. Manufacturer shall complete Form HSD, paragraph 15.9, and forward to AT&T.

B. RoHS 5/6 compliance is required only for equipment intended for use by AT&T outside of the United States.

C. Per Telcordia Notice to the Industry, November 2006, Reliability Concerns with the use of Lead (Pb) Free Solder in Telecommunications Products and other sources there is continuing concern regarding the use of RoHS 6 compliant equipment for telecommunications applications that require long life and high reliability. RoHS compliant equipment and equipment components proposed for deployment in AT&T network shall need to demonstrate reliability of solder joints equal to or greater than that of RoHS 5 equipment.

Demonstration of reliability shall include:

1. Pb free sub-assembly modules (e.g., hard drives, PCI cards, transceivers, etc.) shall demonstrate compliance to ATIS NIPP proposed ANSI standard *Test Requirements for Pb-*

[1] The European Parliament and Council of the European Union, " Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE)," Official Journal of The European Union, February 12, 2003, pp. L 37/24-38.

Free Subassembly Modules contained in Appendix D of this document. Vendor shall complete and return the checklist contained in Section 4.3 of this document[2].

2. Pb free assemblies (e.g., circuit boards, etc.) shall demonstrate compliance to the draft ATIS NIPP proposed ANSI standard *Guideline for Pb-Free Assembly Qualification and Test Requirements for Printed Wiring Board Assemblies,* contained in Appendix E of this document. Vendor shall complete and return the checklist contained in Section 4.3 of this document[3].

3. RoHS 6 Letter of Attestation verifying compliance to ATIS standards.

4. Copies of test reports for ATIS standards,

5. All reliability and failure rate information (e.g. FIT data) for the product for all previous and existing deployments regardless of service provider or geography.

6. RoHS 6 equipment will be evaluated for approval by AT&T on a case-by-case basis weighing compliance to the above requirements and other risk factors. For example, deployment in an OSP environment, use of large high strain components (e.g. ceramic BGAs), etc. indicate a higher risk of solder joint failure for RoHS 6 equipment, while small plug-in sub-assembly components may pose lower reliability risks.

NOTE 2: The PCN process shall be used for all transitions of existing equipment to RoHS 6.

[2] This document will be republished and reference the ATIS NIPP NPP ANSI standard upon publication. This draft standards are referenced and reproduced with the knowledge and approval of ATIS.

[3] This document will be republished and reference the ATIS NIPP NPP ANSI standard upon publication. This draft standards are referenced and reproduced with the knowledge and approval of ATIS.

13. ENERGY EFFICIENCY TESTING REQUIREMENTS

The purpose of this Section is to provide product suppliers a guide to energy efficiency testing requirements presently being developed by ATIS-NIPP-TEE for publication as ANSI standards. These draft standards are referenced and reproduced with the knowledge and approval of ATIS.

The draft standard,ATIS-600015.XXXX, The Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting - General Requirements establishes the test methodology, environmental factors and utilization of the equipment for measuring the energy used in the formation of the telecommunications energy efficiency rating. The procedures shall be applied in a controlled laboratory environment. Testing is to be performed at a third party test laboratory. The supplier may also additional data for configurations different from those tested by the third party test laboratory.

ATT-TP-76200 will be republished and reference the various ATIS NIPP TEE ANSI standards upon publication in this section. They will be used to establish baselines for minimum energy efficiency of network elements. The supplemental standards will create Telecommunication Energy Efficiency Ratios (TEER) by equipment type.

TEER is the ratio of useful work over power consumed, $TEER = \frac{UsefulWork}{P_{TEER}}$.

The equipment types are presently categorized as Core, Transport, Access, CPE, and Power Systems based on application and location in the network. At present there are three standards that have been distributed for voting and comments. These standards are:

- **Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting - General Requirements**
- **Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting - Transport Requirements**
- **Energy Efficiency for Telecommunication Equipment: Methodology for Measurement and Reporting - Server Requirements**

The proposed standards, as distributed, are found in Appendix E of this document. Test results shall be reported using the format defined in the appropriate standard

14. OUTSIDE PLANT DEPLOYMENT CONFIGURATIONS AND ENCLOSURES

Deployment Configurations

14.1. Deployment Configurations

The configuration of equipment deployed in OSP cabinets shall be approved by OSP staff prior to approval. OSP contact:

Duane Arnold
3901 SW LOOP 820
Fort Worth, TX, 76133-2026
Phone: (817)370-4004
e-mail: ba5811@sbc.com

OSP Enclosures

14.2. General

This section contains physical requirements for OSP enclosures. Typically each type of enclosure shall conform to the physical requirements sections (e.g., rain, sand, salt fog, mold, insects, chemicals, drop test, etc.) of the applicable Telcordia GR. This section does not cover Huts and CEVs. For verification of test requirements for OSP cabinets and other enclosures contact Duane Arnold at (817) 370-4004.

NOTE: The Fast Track Process may not be used for OSP enclosure evaluations.

14.3. Generic Pedestal Mounted Electronic Equipment Enclosures

Unless otherwise stated in this section pedestal-mounted OSP electronic equipment enclosures shall meet the requirements contained in Telcordia GR-487.

14.4. Generic Outside Building Mounted Electronic Equipment Enclosures

Unless otherwise stated in this section OSP electronic equipment enclosures mounted on the outside of buildings will meet the applicable requirements contained in Telcordia GR-950-CORE or GR-49-CORE. Typically this will include NIDs, ONTs, etc. mounted on the outside of single family residences, MDUs and small businesses.

NOTE: When the enclosure contains active electronics, environmental tests must be performed with the exterior of the Network Access Door exposed (i.e. door closed) to the environmental stressors. The ONT must continue to function as designed during and after tests.

14.5. Generic Inside Customer Premises Electronic Equipment Enclosures

Electronic equipment enclosures deployed inside customer premises shall meet:

A. GR-63-CORE, Issue 3, Sections 4.2 and 4.7.

B. GR-1089-CORE, Issue 4, Section 7.2.

C. GR-2890-CORE Section 6

15. Product Information Form Description

15.1. General

This section includes product information forms to help suppliers communicate product information in a way that will facilitate the product evaluation process. These product information forms may be reproduced as necessary. The product information forms shall be completed and provided for new products and for enhanced products for equipment already approved for use in AT&T.

15.2. ESR Forms

The ESR *Equipment Supplier Response* forms are provided so equipment suppliers can effectively communicate product attributes relative to the requirements and objectives contained in this section. A separate ESR form is required for each "product" being evaluated. Suppliers may use a single ESR form for multi-unit products provided that any entries that are not applicable for all units being evaluated are specifically qualified in an ESR attachment.

The following describes how the ESR entries are defined and will be interpreted during the product evaluation process. A response is required to every item in the ESR form.

Column	Description
Item	This is the applicable paragraph number in this section.
Reference	This is the product attribute being addressed in "key-word(s)" form.
Y	An "X" here means the product complies and requested data is being furnished.
N	An "X" here means the product does not comply or the requested data is not being provided at this time. A "No data" response shall be accompanied by an expected date of when the information will be made available.
n/a	An "X" here means that, in the opinion of the supplier, the item is not applicable to the product. Provide an explanation why the requirement is "n/a" for this product.
Att. #	An entry here (alpha, numeric, or combination) identifies the ESR attachment containing the requested data or an explanation of the response entered.

Note: A simple identification system for attachments (e.g. A, B, C...) is preferred, but other schemes are acceptable. When a single attachment is used for more than one ESR item, each entry in the attachment shall be identified using the corresponding ESR item number.

15.3. ESP Forms

The engineering and space planning forms provide a detailed overview of the planning and engineering considerations associated with products being evaluated. *System Equipment* form ESP-001 applies to products comprised of multiple equipment units installed in a predefined configuration. Such products may be furnished preinstalled in an equipment framework assembly (frame level) or as shelf level products (individual units) for installation into existing equipment framework assemblies. *Equipment Unit* form ESP-002 applies to stand-alone shelf level products.

Suppliers shall complete an ESP-001 form for frame level products, each frame of multi-frame products, and for shelf level products that are optionally available preinstalled in an equipment framework assembly. The ESP-002 form shall be completed for individual shelf level products.

15.4. FRM Form

Form FRM-001 *Fire Resistance of Materials* shall be completed by the product supplier's representative having explicit knowledge of the subject addressed. The FRM form may be used for multi-unit products provided each individual unit comprising the product is specifically referenced in the space provided.

15.5. HSD Form

Form HSD, *Hazardous Substances Declaration,* shall be completed by product supplier’s representative having explicit knowledgeof the subject addressed. The HSD Form may be used for multi-unit products provided each individual unit comprising the product is specifically referenced in the space provided.

15.6. LOA-LE Form

Form LOA-001, *Letter of Attestation for Lab Entry,* shall be completed, signed and notarized by supplier when equipment is intended for placement in AT&T test laboratories and the equipment does NOT meet Objective 1.10.B of this document.

16. PRODUCT INFORMATION FORMS:

NOTE: See following pages:

Form ESP-001

EQUIPMENT ENGINEERING & SPACE PLANNING DATA

Equipment Systems (1)

Manufacturer:_____ Product Name:_____ Date:_____

Equip. Functional Description and Nomenclature: _____

Floor Plan Designation: _____Number of Frames Per System: _____

Names of Associated Frames: _____

PHYSICAL DATA (2)

Overall Dimensions Including Framework: Height: _____ Width (3): _____ Depth: _____

Equipment Weight: –Approximate Installed Weight (fully equipped) _____ lbs _____ lbs.

ENGINEERING DATA (2)

Framework Type/Description: _____

Manufacturer's Identifying Catalog/Part Number: _____

Minimum Aisle Spacing Requirements: Front: _____ Rear: _____

Additional Space Requirements, if applicable, Between This Frame and An:

Adjacent Like Frame: _____ End Guard: _____ Other Frames or Structure: _____

Equipment Locating Restrictions: None ____ Yes (Explain):

120 V ac Required: Yes: ___ No: ___ Circuit Breaker Size per feeder: _____

Number of feeders: ____ -48 V DC Required: Yes: ___ No: ___

Feeder 1 (Load A): List 1 drain: _____amps at _____V
List 2 drain: _____amps at 42.6V
List 2X drain _____amps at 42.6V

Feeder 2(Load B): List 1 drain: _____ amps at _____V
List 2 drain: _____ amps at 42.6V
List 2X drain _____amps at 42.6V

(List 2X is defined in ATT-TP-76450)

Minimum Operating Voltage _____and current _____from test in Section 7.3

DC-C___ or DC-I ___ configuration per section 9.8.3 of GR-1089-CORE, Issue 4

EXTERNAL CABLING DATA

Equipment Cabling Plan Reference/Drawing Number: _____

Do Special Cable Or Cabling Requirements Apply: No ___ Yes ___ (Describe):

(1) One form required per each frame of multi-frame system equipment.
(2) All dimensions to be expressed in FEET and INCHES.
(3) Width includes normal 1/16 inch space between adjacent frames

ESP-001

HEAT DISSIPATION DATA SHEET

Manufacturer:_____ Product: _____ Date:_____

***NOTE**: Total heat dissipation of product should not exceed List 1 drain

List each active component in system:	**Total List 1 drain in Watts:**	**No. Units to be Used in System[1]**		**Heat Dissipation per Unit/Traffic %[2]**		**Heat Diss Watts: B x D**
Description/Card Number	**Part Number**	**A: Max Poss:**	**B: AT&T Est:**	**C: Max %Traffic**	**D: AT&T Est:**	
					Total Watts for System:	

Air exhaust design: Does equipment exhaust heated air in back? Yes___ No ___ If No, attach description of air exhaust design.

1. **Max Poss:** The maximum number of units of this component that can be used in the system as designed
   AT&T Est: The maximum number of units of this component per AT&T planned deployment
2. **Max %:** Heat dissipation for a unit in W, when operating at maximum capacity
   AT&T Est: Heat dissipation for a unit in W, when operating at maximum capacity expected for AT&T deployment
3. **Heat Diss Watts, AT&T Est:** Maximum number of units estimated for AT&T deployment times heat dissipation per unit apparatus

16.1. ***Form ESP-002***

ENGINEERING & SPACE PLANNING EQUIPMENT DATA

Shelf Level Equipment Units (1)

Manufacturer:_____ Product Name:_____ Date:_____

Unit Functional Description: _____

Product ID: _____ Nomenclature (Acronym): _____

Names of Associated Units per Function: _____

EQUIPMENT DATA

Overall Dimensions (inches): Height:____ Depth (2):_____ Width: _____

Unit Weight: Unit Installed Weight (fully equipped) _____ lbs

Minimum Aisle Spacing Requirements (feet & inches): Front: _____ Rear: _____

Requires 120 V ac: Yes ___ No ___Circuit Breaker Size per feeder: ____

Number of feeders: ___ -48 V DC: Yes: ___ No: ___

Feeder 1 (Load A): List 1 drain: _____amps at _____V
List 2 drain: _____amps at 42.6V
List 2X drain _____amps at 42.6V

Feeder 2(Load B): List 1 drain: _____ amps at _____V
List 2 drain: _____ amps at 42.6V
List 2X drain _____amps at 42.6V

(List 2X is defined in ATT-TP-76450)

Minimum Operating Voltage _____and current _____from test in Section 7.3

DC-C___ or DC-I ___ configuration per section 9.8.3 of GR-1089-CORE, Issue 4

Heat Baffles Required: Yes ___ No ___ If Yes, Supplied With Unit: Yes ___ No ___

UNIT TO FRAMEWORK MOUNTING DATA

Supported Mounting Flange Hole Patterns: 1 3/4 x 19" ___ 1 3/4 x 23" ___ 2 x 23" ___

Unit Mounts to Front of Framework Uprights: Yes ___ No ___

List Unit Locating Restrictions/Considerations if Any: _____

_____

Distance Unit Extends From Framework Mounting Surface: _____ (in.)

EXTERNAL CABLING DATA

Unit Cabling Plan Reference/Drawing Number: _____

Unit Is Cabled From The Rear: Yes ___ No ___ Front and Rear: _____

Required Alarm Leads and Designations: _____

Do Special Cable Or Cabling Requirements Apply: No ___ Yes ___ (Describe):

(1) One form required per each unit of a multi-unit product/system.
(2) Overall depth includes cable and its supporting apparatus.

ESP-002

HEAT DISSIPATION DATA SHEET

Manufacturer:_____ Product: _____ Date:_____

***NOTE**: Total heat dissipation of product should not exceed List 1 drain

List each active component in system:	**Total List 1 drain in Watts*:**	**No. Units to be Used in System[1]**		**Heat Dissipation per Unit/Traffic %[2]**		**Heat Diss Watts: B x D**
Description/Card Number	**Part Number**	**A: Max Poss:**	**B: AT&T Est:**	**C: Max %Traffic**	**D: AT&T Est:**	
				Total Watts for System:		

Air exhaust design: Does equipment exhaust heated air in back? Yes___ No ___ If No, attach description of air exhaust design.

1 **Max Poss:** The maximum number of units of this component that can be used in the system as designed
AT&T Est: The maximum number of units of this component per AT&T planned deployment

2. Max %: Heat dissipation for a unit in W, when operating at maximum capacity
AT&T Est: Heat dissipation for a unit in W, when operating at maximum capacity expected for AT&T deployment

3. **Heat Diss Watts, AT&T Est:** Maximum number of units estimated for AT&T deployment times heat dissipation.

Form FRM-001

LETTER OF COMPLIANCE ATTESTING TO FIRE RESISTANCE OF MATERIALS

Manufacturer:_____ Product Name:_____ Date:_____

This statement of compliance applies to the following product(s) which are being considered for purchase:

The below individual having reasonable control over the fire resistance characteristics of materials and components used in the construction and manufacture of the above product(s) assures that:

1. ___ All materials and components, except those listed below, meet the fire resistance requirements contained in the current issue of ANSI T1.307 *Fire Resistance Criteria - Part 1: Ignitability Requirements for Equipment Assemblies, and Fire Spread Requirements for Interconnection Wire and Cable Distribution Assemblies*.

2. ___ Products having an exposed surface area < ft.^{2} (0.09 m^2) shall be formed from materials having a fire resistance characteristic equivalent to or better than UL-94 V-0 at its minimum rated thickness (T1.307 section 4.4.1 a).

3. ___ Products having an exposed surface area >1 ft.^{2} (0.09 m^2) to 10 ft.^{2} (0.93 m^2) shall be formed from materials having a fire resistance characteristic equivalent to or better than UL-94 5VA at its minimum rated thickness (T1.307 section 4.4.1 b).

4. ___ Products having an exposed surface area >10 ft.^{2} (0.93 m^2) shall be formed from materials having a fire resistance characteristic equivalent to or better than UL-94 5VA at its minimum rated thickness, and shall have a flame spread rating of <200. Flame spread ratings may be determined by radiant panel test methods that are equivalent to those contained in UL standard 94, *Tests for flammability of plastic materials for parts in devices and appliances* or UL standard 723 *Test For Surface Burning Characteristics Of Building Materials* (T1.307section 4.4.1 c).

5. ___ Items 2, 3 and 4 are not applicable to the product(s).

The below non-metallic components (other than LEDs, small cable ties and terminal lug insulators) do not or may not comply with Items 1 through 4 above. The combined weight of the listed components is _____ grams.

_____ _____
Signature Printed name

_____
Title

16.2. Form ESR-001

Level One
ATT-TP-76200 Minimum Safety Requirements:
CO and Non-CO Building Deployment Locations

Manufacturer:_____ **Product Name:**_____ **Date:**_____

CENTRAL OFFICE DEPLOYMENT

2. GR-1089 Electromagnetic Compatibility & Electrical Safety Requirements: Note The requirement numbers below are the GR1089 Absolute Requirement Numbers. See GR1089, Paragraph 1.4.1

R #	Description	Y	N	n/a	Att.#	R #	Description	Y	N	n/a	Att.#
N/A	Equipment Type										
8	Radiated Emissions					41	EUT not meet require.				
9	Radiated Emissions Obj.					54	Class A1 Voltage				
10	Radiated Emissions					55	Class A2 Voltage				
11	Radiated Emissions					56	Class A3 Voltage				
12	Conducted Emissions					57	Class A3 segregtd				
128	Common Mode Emiss.					58	Class A3 Labeled				
14	Unintentional Cond Em					59	Class AB restricted				
34	Current Limiting Prot.					60	Class AB inacces.				
22	Listing AC Power					61	Rubber gloves ...				
23	Listing Inverters					62	Eqpt pwrd by gen.				
24	Listng Cust Prem Equip					63	Class B de-enrgzd				
25	EUT damage					64	Interrupted/tripped v.				
29	EUT Safety Hazard					65	Voltage interrupted				
33	EUT Safety Hazard					66	Int./Tripped include				
36	EUT Safety Hazard					67	Peak Voltage				
37	Series Type Network					68	Sources Com. Wire				
137	EUT Safety Hazard					69	Current - 100cm				
39	EUT on Cust. Prem					70	Current - 1cm				
40	EUT Safety Hazard					71	Current measured				
						115	Continuous Source Volt				
						125	EUT Safety Hazard				

Other ATT-TP-76200 Requirements:

5. Grounding						**9. Shock and Vibration**					
5.0	GR-1089, Section 9					9.4	Positive Latching				
						9.6	Standard Frames				
6. Thermal											
C. Heat Dissipation						**10. Fire Resistance**					
6.3A1	Heat Dissip. Data[1]					10.3	Material Compon.				
6.3A2	Fan forced					10.4	Panels/Barriers				
6.3A3	Flow front to back					10.5	Fire Spread				
6.3A4	Face Temperature					Fire Test Video Included					
6.3B	OSP Heat Dissip.					Completed FRM-001 Form					

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NON-CENTRAL OFFICE BUILDINGS:

	Description	Y	N	n/a	Att.#		Description	Y	N	n/a	Att.#
NRTL listing						FCC Part 15[2]					

1. Use appropriate ESP form to report this information.
2. Compliance to GR-1089 criteria [8-12, 14,128] referenced in Section 2 above may be accepted in lieu of FCC Part 15 compliance.

16.3. ESR-001-OSP

Level One
ATT-TP-76200 Minimum Safety Requirements:
Outside Plant Cabinets and Enclosures

Manufacturer:_____ **Product Name:**_____ **Date:**_____

CENTRAL OFFICE DEPLOYMENT											
2. GR-1089 Electromagnetic Compatibility & Electrical Safety Requirements: Note The requirement numbers below are the GR1089 Absolute Requirement Numbers. See GR1089, Paragraph 1.4.1											
R #	**Description**	**Y**	**N**	**n/a**	**Att.#**	**R #**	**Description**	**Y**	**N**	**n/a**	**Att.#**
N/A	Equipment Type					54	Class A1 Voltage				
8	Radiated Emissions					55	Class A2 Voltage				
10	Radiated Emissions					56	Class A3 Voltage				
11	Radiated Emissions					57	Class A3 segregtd				
12	Conducted Emissions					58	Class A3 Labeled				
13	Common Mode Emiss.					59	Class AB restricted				
14	Unintentional Cond Em					60	Class AB inacces.				
20	Manuf. CO switching.					61	Rubber gloves ...				
34	Current Limiting Prot.					62	Eqpt pwrd by gen.				
22	Listing AC Power					63	Class B de-enrgzd				
23	Listing Inverters					64	Interrupted/tripped v.				
24	Listng Cust Prem Equip					65	Voltage interrupted				
25	EUT damage					66	Int./Tripped include				
29	EUT Safety Hazard					67	Peak Voltage				
33	EUT Safety Hazard					68	Sources Com. Wire				
36	EUT Safety Hazard					69	Current - 100cm				
37	Series Type Network					70	Current - 1cm				
137	EUT Safety Hazard					71	Current measured				
39	EUT on Cust. Prem					115	Continuous Source Volt				
40	EUT Safety Hazard					125	EUT Safety Hazard				
41	EUT not meet require.										
Other Applicable ATT-TP-76200 Level 1 Requirements:											
5. Grounding						**10. Fire Resistance**					
5.0	GR-1089, Section 9					10.5C	GR-3108, Section 6.5.				
6. Thermal						Completed FRM-001 Form					
C. Heat Dissipation											
6.3B	OSP Heat Dissip.										

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16.4. Form ESR-002

Level Two
ATT-TP-76200 Requirements for Deployment of Non-network Equipment in Mission Critical Data Room*

Manufacturer:_____ **Product Name:**_____ **Date:**_____

MINIMUM SAFETY REQUIREMENTS:				
DESCRIPTION	Y	N	n/a	Att.#
Equipment is listed by an NRTL				
Equipment is compliant to FCC Part 15 EMC requirements				

RELIABILITY REQUIREMENTS:											
Item	Reference	Y	N	n/a	Att.#	Item	Reference	Y	N	n/a	Att.#
2 GR-1089-CORE						GR-63-CORE					
Equipment Type						**6 Thermal**					
EMI Emissions Criteria [8,10,11,12,13,14]						**6.1D Temperature and Humidity**					
EMI Immunity Criteria [16,18]						Operating Conditions only for GR-63, Criteria [72,73]					
Lightning Immunity, 1st & 2nd Level Criteria: [27,28,29, 30-33]											
AC Power Fault Immunity						**8 Airborne Contaminants**					
AC Power Fault Immunity, 1st & 2nd Level Criteria [[35-37& 39-41]						8.1	Indoor, GR-63, 10 Day				
Short Circuit Test [25]											
Current Limiting Protector Test [34]											
Voltage Limiting Protector Test [20]											
Electrical Safety											
Listing Requirements [22-24]											
Electrical Safety Criteria [54-71]											
Steady State Power Criteria: [42,44,46-49]						**9 Shock and Vibration**					
						9.3	Earthquake, Zone 2				
						9.8	Office Vibration				
4 Electrostatic Discharge											
Normal Operations and I&R Criteria [1-3, 5-7]						12 Physical Design and Manufacturing					
						12.1	GR-78				
						12.2B	RoHS 5/6 Compliant				
						12.2B	Assembled/Lead Solder				

See Section 1.6 for definition of Mission Critical Data Room

16.5. ESR-003-CO

Level Three CO
ATT-TP-76200 Requirements for Equipment Deployed at CO Locations

Manufacturer:_____ **Product Name:**_____ **Date:**_____

Item	Reference	Y	N	n/a	Att.#
2 Electromagnetic Compatibility/Electrical Safety					
2.2	Equipment Type				
2.3	Rad. Emission				
2.4	Cond. Emission				
2.5	Immunity				
2.6	Lightning/AC Pwr.				
2.7	Steady State Pwr.				
2.8	Electrical Safety				
2.9	DC Potential				
3 Acoustic Noise					
3.1	Meet GR-63				
4 Electrostatic Discharge & Fast Transient					
4.1	GR-1089,				
4.2	GR-1089,				
4.3	GR-1089,				
5 Grounding					
5.1	GR-1089, Section 9				
6 Thermal					
6.1 Temperature and Humidity					
6.1A	Indoor, GR-63				
6.2 Altitude					
6.2A	Indoor GR-63				
6.3. Heat Dissipation					
6.3A1	Heat Dissip. Data*				
6.3A2	Forced Air Cooled				
6.3A3	Flow Front to Back				
6.3A4	Face Temperature				

Item	Reference	Y	N	n/a	Att.#
7 DC Power					
7.2	Under voltage				
7.3	Min. Operating V*				
7.4	Cutoff and Recovery				
7.5	Current Drain*				
7.6	Over voltage transient				
7.7	Protective Device trans				
7.8	Noise Immunity				
7.9	Under voltage				
7.10	Dual Power Source				
8 Airborne Contaminants					
8.1	Indoor, GR-63				
8.3	Fan Filters				
9 Shock and Vibration					
9.1	Transport				
9.2	Vibration				
9.3	Earthquake				
9.4	Positive Latching				
9.5	Hard Drive Backup				
9.6	Standard Frames				
9.7	Self Support Frame				
9.8A	Office Vibration, Indoor				
9.9	Floor Loading				
10 Fire Resistance					
10.3	Materials & Comp.				
10.4	Protective Barriers				
10.5	Fire Spread				
Fire Test Video Included:					
Completed FRM-001 Form					
11 Spatial					
11.4	Equipment and Framework				
11.5	Equipment Loading				
11.6	Equipment Units				
11.7	OSP				
12 Physical Design and Manufacturing					
12.1	GR-78				
12.2B	RoHS 5/6 Compliant				
12.B	Assembled/Lead Solder				

* Use appropriate ESP form to report this information.

16.6. ESR-003-NCO

Level Three NCO
ATT-TP-76200 Requirements for Equipment Deployed at Buildings Other Than Central Offices and Mission Critical Data Rooms[1]

Manufacturer:_____ **Product Name:**_____ **Date:**_____

Item	Reference	Y	N	n/a	Att.#
2 Electromagnetic Compatibility/Electrical Safety					
2.2	Equipment Type				
2.3	Rad. Emission				
2.4	Cond. Emission				
2.5	Immunity				
2.6	Lightning/AC Pwr.				
2.7	Steady State Pwr.				
2.8	Electrical Safety				
2.8	NRTL Listing (required)				
2.9	DC Potential				
3 Acoustic Noise					
3.1	Meet GR-63				
4 Electrostatic Discharge & Fast Transient					
4.1	GR-1089, Sec 2.1.2				
4.2	GR-1089, Sec 2.1.2.4				
4.3	GR-1089, Sec 2.2				
5 Grounding					
5.1	GR-1089, Section 9				
6 Thermal					
6.1 Temperature and Humidity					
6.1A	Indoor, GR-63				
6.2 Altitude					
6.2A	Indoor GR-63				
6.3. Heat Dissipation					
6.3A1	Heat Dissip. Data[2]				
6.3A4	Face Temperature				

Item	Reference	Y	N	n/a	Att.#
7 DC Power (if applicable)					
7.2	Under voltage				
7.3	Min. Operating V*				
7.4	Cutoff and Recovery				
7.5	Current Drain*				
7.7	Over voltage transient				
7.8	Protective Device trans				
7.9	Noise Immunity				
7.10	Dual Power Source				
8 Airborne Contaminants					
8.1	Indoor, GR-63				
8.3	Fan Filters				
9 Shock and Vibration					
9.1	Transport				
9.2	Vibration				
9.3	Earthquake				
9.4	Positive Latching				
9.5	Hard Drive Backup				
9.6	Standard Frames				
9.7	Self Support Frame				
9.8A	Office Vibration, Indoor				
9.8B	Office Vibration, OSP				
9.9	Floor Loading				
10 Fire Resistance					
10.3	Materials & Comp.				
12 Physical Design and Manufacturing					
12.1	GR-78				
12.2B	RoHS 5/6 Compliant				
12.2B	Assembled/Lead Solder				

1. NOTE: Equipment intended for deployment in both CO and non-CO locations must be compliant to both Level 3 CO & NCO requirements, 2. Use appropriate ESP form to report this information.

Level Three OSP
ATT-TP-76200 Requirements for Equipment Deployed in Outside Plant

Manufacturer:_____ **Product Name:**_____ **Date:**_____

CLASS 2 & 3[1] OSP ELECTRICAL COMPONENT REQUIREMENTS[2]											
Item	Reference	Y	N	n/a	Att.#	Item	Reference	Y	N	n/a	Att.#
2 Electromagnetic Compatibility/Electrical Safety						**6.3. Heat Dissipation**					
2.2	Equipment Type					6.3B	GR-3108, Section 4.1[3]				
2.3	Rad. Emission										
2.4	Cond. Emission					**7 DC Power**					
2.5	Immunity					7.2	Under voltage				
2.6	Lightning/AC Pwr.					7.3	Min. Operating V*				
2.7	Steady State Pwr.					7.4	Cutoff and Recovery				
2.8	Electrical Safety					7.5	Current Drain*				
2.9	DC Potential					7.6	Over Voltage				
						7.7	Over voltage transient				
						7.8	Protective Device trans				
3 Acoustic Noise						7.9	Noise Immunity				
3B	GR-487, Section 3.29					**8 Airborne Contaminants**					
						8.2 A	GR-3108, Section 6.4				
						8.2 B	GR-3108, Section 6.1				
4 Electrostatic Discharge & Fast Transient						8.3	No fan filters				
4.1	GR-1089 Section 2					**9 Shock and Vibration**					
						9.1 B	Transport & Handling				
5 Grounding						9.2	Vibration				
5.1	GR-1089, Section 9					9.3	Earthquake				
						9.4	Positive Latching				
6 Thermal						9.5	Hard Drive Backup				
6.1 Temperature and Humidity (pick applicable rqmt)						9.7	Self Support Frame				
6.1B	GR-3108, Section 4					9.8B	Office Vibration, OSP				
6.1B	Fan Failure					**10 Fire Resistance**					
6.1C	GR-3108, GR-487					10.5C	GR-3108, Section 6.5.				
6.2 Altitude						12 Physical Design and Manufacturing					
6.2B						12.1	GR-78				
						12.2B	RoHS 5/6 Compliant				
						12.2B	Not RoHS 6/6 Compliant				

1. Equipment must conform to requirements applicable to Class of Environment intended for deployment
2. Equipment intended for deployment in both CO and OSP locations must be compliant to both Level 3 CO & OSP requirements
3. Use appropriate ESP form to report this information.

NOTE*:* The configuration of equipment deployed in OSP cabinets must be approved by OSP staff prior to approval for use. See paragraph 12.1 of this document.

OSP ENCLOSURES (select applicable requirement)											
Item	Reference	Y	N	n/a	Att.#	Item	Reference	Y	N	n/a	Att.#
Pedestal & Pole Mounted Enclosures						Inside Customer Premises Equipment Enclosures					
14.3	GR-487, Section 3					14.5	GR-63, Sections 4.2 & 4.7				
Outside Building Mounted Enclosures						14.2 D	GR-1089, Section 7.2				
14.4	GR-950, Section 5					14.2 D	GR-2890, Section 6				
14.2 C	Rain Resistant										
14.2 C	Flood Resistant										

16.7. Form ESR-ANC

Ancillary Equipment
Level 1[1] and Level 3 ATT-TP-76200 Requirements

Manufacturer:_____ **Product Name:**_____ **Date:**_____

Item	Reference	Y	N	n/a	Att.#
2. Electromagnetic Compatibility/Electrical Safety					
2.2	**Equipment Type**				
2.3	**Rad. Emission**				
2.4	**Cond. Emission**				
2.5	**Immunity**				
2.6	**Lightning/AC Pwr.**				
2.6	**Fault Testing**				
2.7	**Steady State Pwr.**				
2.8	**Electrical Safety**				
4. Electrostatic Discharge					
4.1	GR-1089, Sec 2.1.2				
4.2	GR-1089, Sec 2.1.2.4				
4.3	GR-1089, Sec 2.2				
5. Grounding					
5.1	DC Short Circuit				
5.1	AC Short Circuit				
6. Thermal					
6.1 Temperature and Humidity					
6.1A	Indoor, GR-63				
6.1B	OSP , GR-3108				
6.3 Heat Dissipation					
6.3A1	Heat Dissip. Data[2]				
6.3A2	Forced Air Cooled				
6.3A3	Flow Front to Back				
6.3A4	Face Temperature				

Item	Reference	Y	N	n/a	Att.#
7. DC Power					
7.2	Under voltage				
7.3	Min. Operating V*				
7.4	Cutoff and Recovery				
7.5	Current Drain*				
7.6	Over Voltage				
7.7	Over voltage transient				
7.8	Protective Device trans				
7.9	Noise Immunity				
8. Airborne Contaminants					
8.1	Indoor, GR-63				
8.2	OSP , GR-3108				
9. Shock and Vibration					
9.2	Vibration				
9.3	Earthquake				
9.8	Office Vibration				
10. Fire Resistance					
10.3	Materials & Comp.				
10.4	Protective Barriers				
10.5	Fire Spread				
Fire Test Video Included:					
Completed FRM-001 Form					
12 Physical Design and Manufacturing					
12.1	GR-78				
12.2B	RoHS 5/6 Compliant				
12.2B	Assembled/Lead Solder				

NOTE:

Some tests may not be required if circuit packs can be demonstrated to be similar to original circuit packs in construction. See Appendix B.

1. Level 1 Ancillary requirements are shaded in gray
2. Use appropriate ESP form to report heat dissipation data.

16.8. Form HSD, Page 1

HAZARDOUS SUBSTANCES DECLARATION

Supplier: Product Name:

Product ID: Nomenclature (Acronym):

The supplier declares that it complies with all laws and regulations that apply to this product. Specifically, the supplier shall declare if this product contains any hazardous substances listed by the regulatory agencies (USEPA, US OSHA, state and local regulatory bodies) or in the EU Directive 2002/95/EC[1] (RoHS) in excess of maximum level of content listed by Commission Decision[4] regarding maximum concentration values[2].

The supplier shall complete Page 2 and Page 3 of this form to declare:

1. If the product contains hazardous substances as defined by the regulatory agencies (USEPA, US OSHA, state and local regulatory bodies and European Union) and, if so, the supplier shall identify the material and the steps that should be taken to mitigate it toxicity.

2. If the product contains any of the following hazardous substances identified in RoHS and, if so, why the substances cannot be removed.

- Lead
- Mercury
- Cadmium
- Hexavalent Chromium
- Polybromonated biphenyls (PBBs), or
- Polybrominated diphenyl ethers (PBDE).

The product is RoHS 5/6[3] compliant: YES ☐ NO ☐

The product is RoHS 6/6[4] compliant: YES ☐ NO ☐

(Company name) has caused this Letter of Declaration to be executed by its duly authorized representative as of the date written below.

By:

Title:

Date:

NOTE: This affidavit must be signed in front of a notary and notarized

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1. The European Parliament and Council of the European Union, " Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE)," Official Journal of The European Union, February 12, 2003, pp. L 37/24-38.
2. Commission Decision," Amending for the Purposes of Adapting to the Technical Progress the Annex to Directive 202/95/EC of the European Parliament and of the Council for the Purpose of Establishing the Maximum Concentration Values for Certain Hazardous Substances in Electrical and Electronic Equipment (EEE)," Official Journal of the European Union, August 19, 2005, pp. L 214/65.

3. Compliant to all RoHS restrictions except lead. RoHS 5/6 is acceptable for any AT&T equipment and is required for equipment deployed outside of the United States.
4. Compliant to all RoHS restrictions. RoHS 6/6 equipment must meet solder joint reliability standards from Section 12 of this document.

15.10 Form HSD, Page 2

Product Declaration

Manufacturer: Product Name:
RoHS 5/6 Compliant? Yes: ☐ No: ☐ RoHS 6/6 Compliant*? Yes: ☐ No: ☐
*Circuit boards assembled with lead-free solder

		HS Present per [4]		List hazardous substance(s)	Reason for RoHS non- compliance[7]
Description/Card Number[5]	Part Number	EPA[6]	RoHS		

Note: add more rows as necessary

_____

4. Answer "No" if no hazardous substance present per each directive, "yes" if present.
5. Reasons for RoHS non-compliance:

Should the supplier's products contain any of substances listed above, the supplier shall declare the restricted substance and whether that the product falls into one of the following categories:

A. The product is on the exemption list contained in Appendix C, section 18 of this document.
B. The product contains the listed substances but must do so in order to meet Telcordia or ATT-TP-76200 standards. The product is not sold within the EU or any other jurisdiction in which the restrictions exist.
C. The product contains the listed hazardous substances because no environmentally preferable alternative exists for the banned chemical. The alternative is "technically or scientifically impracticable… [and] the negative environmental, health and/or consumer safety impacts outweigh the benefits of alternative." or does not meet AT&T requirements of health and safety or network reliability. The supplier has provided sufficient documentation based on comprehensive environmental life cycle assessment (ISO 14040-ISO 14043) and reliability data.
D. Other: Explain

The product contains the listed hazardous substance in excess of the maximum concentration level. The supplier has provided separate corrective action plan regarding the chemical's replacement. This action plan shall include the specific actions and timelines required to replace or eliminate the use of the restricted hazardous substance.
6. List each discreet sub-component system such as chassis, circuit board, etc.
7. If EPA hazardous materials are identified, complete Page 3

15.10 Form HSD, Page 3

Declaration of EPA Hazardous Materials Mitigation Procedures

Manufacturer Product Name

For each hazardous material identified for the product on Form HSD Page 2 complete the following (add more as necessary):

Hazardous Material #1:
Identify steps to:

- Avoid Exposure:
- Avoid injury or further physical damage, if accidentally exposed:
- Properly dispose of substance:

Where are these steps identified in manufacturer's documentation?

Hazardous Material #2:
Identify steps to:

- Avoid Exposure:
- Avoid injury or further physical damage, if accidentally exposed:
- Properly dispose of substance:

Where are these steps identified in manufacturer's documentation?

Hazardous Material #3:
Identify steps to:

- Avoid Exposure:
- Avoid injury or further physical damage, if accidentally exposed:
- Properly dispose of substance:

Where are these steps identified in manufacturer's documentation?

16.9. Form LOA-LE

LETTER OF ATTESTATION – Lab Entry

Equipment Compliance to AT&T Services Technical Publication ATT-TP-76200 Requirements

Form LOA-001, *Letter of Attestation for Lab Entry,* shall be completed, signed and notarized by supplier when equipment is intended for placement in AT&T test laboratories and the equipment does NOT meet Objective 1.10.B of this document.

Per requirement 1.10.B (Company name) hereby asserts, to the best of its knowledge, and pursuant conclusions drawn from sound engineering judgment, that the equipment described below meets or exceeds electrical safety and fire standards as detailed in UL 60950.

Equipment vendor name:

Equipment model:

(Company name) has caused this Letter of Attestation to be executed by its duly authorized representative as of the date written below.

By: _____

Title: _____

Date: _____

Phone Number: _____

NOTE: This affidavit must be signed in front of a notary and notarized

17. APPENDIX A

ATT-TP-76200 PRODUCT EVALUATION PROCESS

17.1. Purpose

The purpose of this appendix is to assist product suppliers with preparing and furnishing equipment documentation to the company representative for product evaluation purposes.

17.2. Types of Evaluations

An evaluation reviews a product against all applicable requirements based on the equipment and its intended use in the network. . Unless otherwise stated, all requirements apply to equipment systems and equipment units that will be installed in network equipment buildings and equipment areas within buildings, electronic equipment enclosures such as controlled environment vaults, outside mounted electronic equipment cabinets, and at customer locations.

Documentation supporting compliance is required for a complete product evaluation. Documentation includes test reports and product information verifying compliance for each applicable requirement. Below are the three types of complete evaluations. The requirements for each type are contained in their corresponding ESR forms:

A. LEVEL ONE (ESR-001). Level One refers to an evaluation against the minimum acceptable set of requirements necessary to protect personnel and the Network. Conformance to Level One requirements must be verified before equipment may be placed in a network equipment environment. Level One requirements are generally applicable to collocated equipment, portable test and monitoring equipment, and equipment trials.

B. LEVEL TWO (ESR-002) Level Two refers to an evaluation against Level 3 – NCO requirements with some environmental reliability requirements modified to account for equipment placed only in Mission Critical Data Rooms.

- Mission Critical Data Room Requirements:
  - Compliant to TIA-942, Telecommunications Infrastructure Standard for Data Centers, including:
    - Dedicated HVAC with HVAC back-up
    - Temperature range 20^{o}C to 25^{o}C
    - Humidity range 40% – 55% RH

C. LEVEL THREE - CO (ESR-003-CO). Level Three - CO refers to an evaluation against all safety and environmental reliability requirements for equipment placed in central offices. Conformance to Level Two – CO requirements is required for network equipment approval and deployment.

D. LEVEL THREE – NCO (ESR-003-NCO). Level Three - NCO refers to a subset of ATT-TP-76200 Level Three – CO safety and reliability requirements applicable for equipment located exclusively in non-central office equipment spaces (e.g. Data Rooms, Customer Premises).

E. LEVEL THREE – OSP (ESR-003-OSP). Level Three - OSP refers to ATT-TP-76200 safety and reliability requirements applicable for equipment located in the Outside Plant.

F. ANCILLARY (ESR-ANC). Ancillary is an evaluation against a minimum set of requirements applicable to products previously approved by AT&T Services that have undergone one or more changes.

G. PORTABLE TEST SET. At a minimum, portable test sets will be reviewed to the following requirements prior to deployment: Electrical Safety Review: An electrical safety review is necessary when the output voltage of the equipment exceeds 140 volts DC or 50 volts rms AC. Radiated Emissions: A review is necessary when the equipment supplier cannot certify compliance to FCC Part 15. In the absence of FCC Part 15 compliance, the radiated emissions requirements and test methods of GR-1089, Section 3 shall apply. Portable test sets that do not exceed 140 volts DC or 50 volts rms AC and are certified compliant to FCC Part 15, may be considered in compliance with the electrical safety and radiated emissions requirements and do not require review by the NEBS group.

H. PRODUCT CHANGE NOTICE (PCN). PCNs must be evaluated for their effect on the equipment's ATT-TP-76200 compliance.

- When it is determined by the manufacturer, using sound engineering judgment, that a hardware or software change does not impact the equipment's ATT-TP-76200 compliance, the manufacturer may submit a letter of attestation to this effect using the form in paragraph 15.6. When the PCN is judged to affect compliance to some requirements, but not all, use form ESR-002 to identify each. For requirements for which compliance is determined not to be affected, mark the "Y" column, for requirements that require testing mark the "N" column and annotate with a brief test plan and status. AT&T Services will review the documentation submitted and determine if more documentation and/or testing are required.

  NOTE: Except for requirements where it is obvious that the PCN will not affect the equipment's compliance, AT&T Services recommends that a third party, independent laboratory evaluate whether testing is necessary to verify compliance.

- When it is determined by the manufacturer, a test lab or AT&T Services that the PCN may affect the equipment's ATT-TP-76200 compliance, the modified equipment must be tested per ATT-TP-76200. Documents verifying compliance to ATT-TP-76200 Ancillary Requirements (ESR-ANC) must be submitted for AT&T Services evaluation as detailed in the Product Evaluation Documentation section of this appendix.

PRODUCT EVALUATION DOCUMENTATION

Documentation verifying that the product has been tested and conforms to applicable ATT-TP-76200 requirements must be submitted to the company representative. There are two acceptable processes for supplying documentation verifying conformance:

17.3. Test Report Documentation Package

Product information shall be assimilated in an organized fashion and provided to the company representative. A cover memo identifying included documentation should be included as a matter of convenience to facilitate the evaluation process. If available, informative product awareness brochures should also be provided but are not required.

A. Test Report Details

Relative to product test reports, AT&T Services accepts test reports from any testing facility adequately equipped and capable of performing the required tests in a professional manner under the requirements noted in paragraph 1.12 of this Section. At a minimum, test reports shall contain the following information:

- Test report number
- Description of Equipment Under Test (EUT), including specific test configuration
- Location and date of test
- Description of test equipment
- Calibration dates of test equipment
- Protocol of test with stated pass/fail criteria
- Test result data
- Assessment of whether equipment passed or failed the test
- Detailed notes on any anomalies during test procedure
- Detailed notes on any modifications made to the equipment in order to pass the test and detailed plans to incorporate the modifications into the final product.

Note: If the documentation is being submitted electronically or via CD disk, the file name or file folder shall clearly identify the file's contents (e.g. GR-63 test data). Reference the file name in the "Doc" cell for applicable requirements.

B. ATT-TP-76200 Forms

Each documentation package shall include an appropriate Equipment Supplier Response form (ESR) that corresponds to the type of evaluation being requested or anticipated.

For each type and level of evaluation the following forms shall be submitted:

- Level One: Completed forms ESR-001, ESP-001 or ESP-002, FRM-001, GR-63 Fire and applicable test report documentation shall be submitted for review.
- NCO-Level: Documentation supporting NRTL-Listing and FCC Part 15
- Level Two: Completed forms ESR-002, ESP-001 or ESP-002, FRM-001, HSD, and all test report documentation shall be submitted for review. An indication of planned testing shall be indicated for any product tests not yet performed

- Level Three - All: Completed forms ESR-003 CO or –ESR-003 NCO, ESP-001 or ESP-002, FRM-001, HSD and all test report documentation shall be submitted for review. An indication of planned testing shall be indicated for any product tests not yet performed.

  Note: The ATT-TP76450 Checklist is required on all CO-Level 3 evaluations.

- Ancillary: Completed forms ESR-ANC, FRM-001, HSD, applicable test report documentation, and/or a description of product revisions shall be submitted for review.

NOTE: Product will not be approved for use without receipt of correct completed forms.

C. AT&T Services Documentation Package Evaluation Process

- The AT&T Services Common Systems Product Evaluation group will review the product Documentation Package. If the product cannot be evaluated as compliant to all applicable requirements, an Initial Letter will be sent to the company representative specifying the areas that are not evaluated in conformance and what further action is required of the product supplier.

- Upon receipt of the Initial Letter, the product supplier may forward supplemental data to or contact the company representative, the AT&T Services Product Evaluation Group Coordinator or a specific SME regarding non-compliance resolution. Contact information for the Group Coordinator and SMEs is contained in the Initial Letter. Documentation, either electronic or hard copy, forwarded to AT&T Services containing supplemental data in response to an Initial Letter should identify the contents of documentation and reference the Product Log number assigned to the product, the SME who requested the data and the non-compliance requirement the data is addressing.

- The SME(s) who requested the documentation will evaluate supplemental data forwarded to AT&T Services by the product supplier. If the supplemental data is sufficient to allow all open areas to be evaluated as in conformance to applicable requirements, a Final Letter will be sent to the company representative notifying them that the product conforms to requirements. If there are still open items after supplemental data has been reviewed, a Product Evaluation Status letter will be sent to the company representative giving the status of the product and what further action the product supplier needs to take.

17.4. AT&T Services Product Evaluation Fast Track Process

AT&T Services has established a fast track process it will use for certain business opportunities to streamline equipment evaluations and shorten time-to-market intervals. The process consists of AT&T Services accepting ATT-TP-76200 compliance Letters of Attestation and minimal product information from equipment suppliers in lieu of the Test Report Documentation Package described above.

A. ATT-TP-76200 Fast Track General guidelines:

1) The process is an optionally agreed upon business arrangement between AT&T Services and an equipment supplier.
2) A supplier must have successfully participated in the Test Report Documentation Package process at least once to be eligible for the fast track process.
3) AT&T Services reserves the right to review any and all test documentation cited in the Letter of Attestation during the time the equipment is an integral component of AT&T's network.
4) Test documentation cited in the Letter of Attestation must be made available to AT&T Services within 20 business days upon receipt of a written request.
5) AT&T Services may take any or all of the following actions for products approved for use via a Letter of Attestation that are subsequently found not to conform to applicable ATT-TP-76200 requirements:
   - Suspend further purchase of the product.
   - Require previously purchased products be brought into compliance.
   - Suspend the supplier's further use of the Fast Track process.
   - Hold the supplier liable for any damages directly resulting from the product's failure to conform to applicable requirements.
6) The equipment must have been tested and found in conformance to **ALL** applicable requirements. **The Fast Track Process will not be accepted if any requirement is not met or is conditionally met.**
7) The Fast Track process may NOT be used if the equipment contains integrated protectors.
8) The Fast Track process may NOT be used for OSP enclosures.

B. AT&T Services Product Evaluation Fast Track Process Procedure for Product Suppliers

1) Verify with the company representative that the Fast Track process is appropriate for the product/project.
2) Complete all applicable tests required by ATT-TP-76200.
3) Review and verify the product's conformance to **ALL** applicable requirements.

4) Complete and submit the Letter of Attestation that is applicable for the Type of Evaluation (i.e., Level 1, Level 2, Level 3 or Ancillary). A template for the letter is contained in Attachment 1. All of the information requested in the applicable template must be completed. The Letter of Attestation must be signed at director level or above and notarized.
5) Complete and submit appropriate ESR Form
6) Complete and submit either form ESP-001 or ESP-002, whichever is applicable for the product.
7) Complete and submit form 16.4.1, Fast Track Report Form
8) Complete HSD Form.

16.4.1 Fast Track Report Form

AT&T SERVICES FAST TRACK REPORT

If the request use of the Fast Track program, this form must be submitted with a complete description of the equipment's design and function. Manufacturer's documents such as brochures may be attached for reference when applicable.

Equipment vendor name:

Equipment model:

Does equipment have optical components? Yes ☐ No ☐

Equipment Port Types (Port Type shall be determined using GR-1089, Appendix B).

General technology description (e.g. DSLAM, DLC, etc.) including drawings, pictures, etc.:

Detailed description of functionality:

17.5. Letter of Attestation

AT&T SERVICES LETTER OF ATTESTATION

Equipment Compliance to AT&T Services Technical Publication ATT-TP-76200 Requirements

(Company name) hereby asserts, to the best of its knowledge, and pursuant to the information contained in the test reports identified herein, that the equipment listed below has been tested and found compliant to **ALL** applicable AT&T LEC Technical Publication ATT-TP-76200 requirements as indicated below.

Equipment vendor name:

Equipment model:

Name of test Facility/internal organization performing tests:

Date of test report(s):

Test report number(s):

Mark the ATT-TP-76200 Requirements to which the equipment conforms.

Requirements met for Level:		**Requirements met for Deployment in:**	
One	☐	Central Office	☐
Two	☐	MC Data Room[1]	☐
Three	☐	NCO[2]/Customer Prem	☐
Ancillary	☐	Outside Plant Class 2	☐
TP 76450	☐	Outside Plant Class 3	☐
		Outside Plant Unprotected	☐

Additional Information

If equipment is intended for use at Customer Premises is it listed for that purpose by a Nationally Recognized Testing Laboratory (NRTL)? Yes ☐ No☐

Has this equipment been modified in any manner to meet requirements? Yes ☐ No☐
If yes, disclose any modification used in testing to the equipment which are necessary to meet ATT -TP-76200 requirements (use page 2 if necessary)

Is shielded cable required to meet GR-1089, Section 4.6.9? If so, explain. Yes ☐ No ☐
(use page 2 if necessary)

Does equipment have integrated protectors? Yes ☐ No ☐
If yes, the Fast Track Process may not be used, full test reports must be submitted for evaluation.

Can the equipment provide powering to external network devices or interfaces by using -48 Volt over twisted pairs? Yes ☐ No ☐
If yes, the Fast Track Process may not be used, full test reports must be submitted for evaluation.

Can the equipment be powered by external -48 Volt? Yes ☐ No ☐
If yes, the Fast Track Process may not be used, full test reports must be submitted for evaluation.

Page 2 of AT&T Services Letter of Attestation

1. Mission Critical Data Room - Dedicated Data Room compliant to TIA-942, Telecommunications Infrastructure Standard for Data Centers, including:
    - Dedicated HVAC with HVAC back-up
    - Temperature range 20°C to 25°C
    - Humidity range 40% – 55% RH
2. Non-central office

(Company name) agrees that statements made in this letter may be audited by AT&T Services via a review of compliance confirmation data (the reports listed above), and that this data will be made available to AT&T Services within 20 business days of request. If the above equipment is determined to not meet AT&T Services requirements as attested to, __ (company name) __ acknowledges and agrees that, at its expense, it will remedy any such non-compliance in accordance with the terms of the contract under which the equipment was evaluated/purchased and/or licensed. .

(Company name) has caused this Letter of Attestation to be executed by its duly authorized representative as of the date written below.
(Company name)

By: _____

Title: _____

Date: _____

NOTE: This affidavit must be signed in front of a notary and notarized
Contact information to request test reports: Name: _____

Phone number: _____

NOTE: Information describing the product must accompany the Letter of Attestation (e.g., brochures, pamphlets etc.)

Disclosure of modifications used to this equipment which are necessary to meet ATT -TP-76200 requirements:

If shielded cable required to meet GR-1089, Section 4.6.9 explain:

17.6. Product Change Notice Statement

LETTER OF ATTESTATION - PCN

Equipment Compliance to AT&T Services Technical Publication ATT-TP-76200 Requirements

(Company name) hereby asserts, to the best of its knowledge, and pursuant conclusions drawn from sound engineering judgment, that the PCN described below has been evaluated as having no significant impact to the compliance of the equipment listed below to **ALL** applicable AT&T LEC Technical Publication ATT-TP-76200 requirements, except as noted below.

Equipment vendor name:

Equipment model PCN is for:

PCN Number:

Description of PCN:

ATT-TP-76200 requirements NOT COVERED by this document (

Describe the engineering justification for concluding the PCN will not affect ATT-TP-76200 compliance:

(Company name) has caused this Letter of Attestation to be executed by its duly authorized representative as of the date written below.

By: _____

Title: _____

Date: _____

Phone number: _____

18. APPENDIX B: ATT-TP-76200 PRODUCT CHANGE TEST GUIDELINES

18.1. Purpose

The purpose of this appendix is to provide product suppliers a guide to help determine what tests may not need to be performed on a product enhancement to verify conformance to ATT-TP-76200 Ancillary requirements.

18.2. General

Some product enhancements are so minor that a complete retest of the product may not be necessary. Typically, when a product supplier requests a re-test waiver to run tests on product enhancements, data comparing the new product to the existing product is submitted to the company representative for evaluation by AT&T Services. Depending on the product under review, this data may include pictures, fire load data, descriptions of electrical components, etc. Each AT&T Services product evaluation subject matter expert (SME) then reviews this data and responds with an assessment of what tests are required**. This Appendix is a guideline only. It is the product suppliers' responsibility to satisfactorily document that the new product conforms to applicable requirements**. This Appendix only applies to product enhancements to equipment previously evaluated as in conformance to applicable ATT-TP-76200 requirements and approved for use in AT&T.

Software upgrades/changes shall be evaluated if it has involves:

- Additional or revised hardware
- Activation of previously unused hardware
- An increase in the amount of power supplied to the hardware

18.3. Retest Guidelines by ATT-TP-76200 Sections

A. Section 2, Electromagnetic Compatibility

Electromagnetic Interference – Emission & Immunity (ATT-TP-76200 Req. 2.04 – 2.09)

- Equipment suppliers should reassess or retest their equipment's Emissions and Immunity performance in accordance with GR-1089 CORE, Section 3.4.7. . As part of their reassessment, equipment supplier shall consider the effects of software changes on the Emissions and Immunity performance of their equipment.

Lightning, AC Power Faults, Steady State Power Induction, Electrical Safety & DC Potential Difference (ATT-TP-76200 Req. 2.10 – 2.20).

- Equipment supplier's should reassess or retest their equipment's performance for Lightning, AC Power Faults, Steady State Power Induction, Electrical Safety & DC Potential Difference whenever materials, components, circuit layout or accessibility is changed. . Equipment should be reassessed or retested when changes in software activate hardware not previously active or affect the equipment's ability to the EMC requirements of ATT-TP-76200 (Req. 2.10 - 2. The equipment's reassessment or retesting may include all of the technical requirements in these sections of ATT-TP-76200. However, the reassessment or retesting is usually limited to only those technical requirements effected by the change in the equipment.

B. Section 3, Acoustic Noise (ATT-TP-76200 Req. 3.01 – 3.03)

- Equipment suppliers should reassess or retest their equipment's Acoustic Noise performance when a change is made to the equipment's fan design, fan control system or a change in the number of fans within the equipment.

C. Section 4, ESD

- Subsystems should be tested whenever changes are introduced that may alter ESD susceptibility. Such changes may include a modified printed wiring board, new components additional components, changes to the power supply, additional telecommunications ports, changes in chassis design, software activation of existing hardware or increased clock speed.

D. Section 5, Grounding

- The only Grounding requirements for Ancillary equipment are the short circuit tests. Embedded ac or dc power supplies should be tested whenever changes are introduced that could alter these. Such changes may include a modified printed wiring board, new components or additional components, changes to the power supply, additional telecommunications ports, changes in chassis design, software activation of existing hardware or increased clock speed.

E. Section 6, Thermal

Temperature and Humidity

If the new product is significantly different from existing compliant products (e.g., different sub components, wiring, spacing, etc.) the previous test data may not be applicable to the new product. In order to be allowed to forego temperature and humidity testing on a new product, the product supplier needs to demonstrate to AT&T Services that the new product is physically almost identical to the existing compliant product. This may be done via photographs, written descriptions, statements, etc.

Heat Dissipation

Heat dissipation should be recalculated whenever a change is introduced that changes the power usage of the unit.

F. Section 7, DC Power

The product supplier may perform an analysis, using good engineering based on similarities to the existing product, predicting the probable conformance of the new product to Ancillary DC Power requirements. This analysis should consider similarities and differences of electric components, wiring, and power levels. The analysis shall be submitted to the company representative for review and approval by AT&T Services.

G. Section 8, Airborne Contaminants

In reference to Airborne Contaminants testing, Telcordia GR-1274-CORE, states that "The qualification test shall be passed once for each new family of printed wiring assemblies." Based on Telcordia's assessment, new assemblies for enhanced products need not be tested for airborne contaminants if they meet the criteria for the same design family of printed boards, defined as follows:

- *A design family consists of printed wiring boards from the same manufacturer; using the same design rules for minimum line spacing and maximum electric field, and using components that require the same bias voltages. Within the same design family, boards shall have the same finish, i.e. they shall all be bare or all be coated with the same overcoat.*

If the product supplier does not test some or all of the printed wiring boards in an enhanced product, they shall supply a statement affirming that the board(s) not tested meets the definition for being in the same design family of a product previously approved for use in AT&T. Documentation verifying the conformance of the tested card must be submitted for review.

H. Section 9, Shock and Vibration

Equipment should be tested whenever changes are introduced that could alter the physical integrity of the unit.

I. Section 10, Fire Resistance:

Reasons for Reassessment

Generally, products that have been determined to be acceptable for purchase from a fire resistance perspective do not have to be re-evaluated or retested unless subsequent changes to the product include one or more of the following:

1) A change in the manufacturer's unique product identifier.
2) A modification to an equipment assembly's enclosure that increases ambient air circulation.
3) The addition of integral or separately mounted cooling fan(s) or a manufacture's requirement or recommendation that fans be used with the equipment.
4) The substitution of metallic apparatus with combustible material.
5) A change in an equipment assembly's electrical protection circuitry that increases the ampere rating of an overload protection device or affects the operational characteristics of a cooling fan.
6) The addition of printed circuit board(s) to one or more existing printed circuit board.
7) The addition of vertically oriented printed circuit boards to the extent that overall circuit board surface area within the unit is increased by 300 cm^2 (46.5 $in.^2$).
8) Evolution of plug-in circuit packs used in a product makes it questionable whether the product accurately resembles its original test configuration.

Acceptance of a new Product by “similarity” as compared with a previously Approved Product.

Generally ,if a pizza box type product having the same size, weight, physical and electrical properties as well as possessing the same material components to that of a product(s) that has been previously tested and passed for fire propagation characteristics, need not be tested again.

An statement is required from an approved testing lab stating:

1) Product “A” contains same material as Product “B”

2) Product ”A” has the same physical and electrical characteristics as product “B”

3) Product “A” has same fire propagation characteristics as Product “B”

Submit:

4) A test report with date and test results for Product “B”

5) Any exception taken during the test of Product “B”

6) Any dissimilarities between Product “A” and Product ”B”

19. APPENDIX C

Exemptions to the European Union Restriction of Certain Hazardous Substances

This appendix details the exemptions that are allowed to RoHS per the European Union.

Application of lead, mercury, cadmium and hexavalent chromium, which are exempted from the requirements of Article 4(1).

1. Mercury in compact fluorescent lamps not exceeding 5 mg per lamp.
2. Mercury in straight fluorescent laps for general purposes not exceeding:
- halophosphate 10 mg
- triphosphate with normal lifetime 5 mg
- triphosphate with long lifetime 8 mg
3. Mercury in straight fluorescent lamps for special purposes.
4. Mercury in other lamps not specifically mentioned in this Annex.
5. Lead in glass of cathode ray tubes, electronic components, and fluorescent tubes.
6. Lead as an alloying element in steel containing up to 0.35% lead by weight, aluminum containing up to 0.4% lead by weight, and as a copper alloy containing up to 4% lead by weight.
7. - lead in high melting temperature type solders 9i.e. tin-lead alloys containing more than 85% lead),
   - lead in solders for servers, storage, and storage array systems (exemption granted until 2010),
   - lead in solders for network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications equipment.
   - lead in electronic ceramic parts (e.g. piezoelectric devices).
8. Chromium plating except for applications banned under Directive 91/338/EEC amending 76/769/EEC relating to restrictions on the marking and use of certain dangerous substances and preparations.
9. Hexavalent chromium as an anti-corrosion of the carbon steel cooling system in absorption refrigerators.
10. Within the procedure referred to I Article 7(2), the Commission shall evaluate the applications for:
    - Deca BDE;
    - mercury in straight fluorescent lamps for special purposes;
    - lead in solders for servers, storage and array systems, network infrastructure equipment for switching, signaling, transmission, as well as network management for telecommunications (with a vie for setting a specific time limit for this exemption);
    - Llight bulbs,

as a matter of priority in oder to establish as soon as possible whether these items are to amended accordingly.

20. APPENDIX D

20.1. Final Draft submitted for Ballott: ATIS Standard on PB-free Modules

ATIS Standard on Pb-free Modules

TEST REQUIREMENTS FOR PB-FREE SUBASSEMBLY MODULES

Secretariat
Alliance for Telecommunications Industry Solutions

Approved Month DD, YYYY

Abstract
This document specifies test requirements for Pb-free Subassembly Modules. Examples of these include but are not limited to power supply modules and optics modules that are later added to a higher level assembly. This document exclusively focuses on those RoHS items specific to the introduction of Pb-free components and does not address requirements for device specific qualification.

FOREWORD

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The NIPP-NPP Pb-free Working Group proposes, develops, and recommends Standards and Technical Reports relating to the use of lead or the restriction of lead in solder used in the manufacturing of telecommunications network equipment. In addition, the group recommends positions on matters, within its scope of expertise, under consideration by other national, regional and international standards development organizations. The subjects of the NIPP-NPP Pb-free Working Group's Standards and Technical Reports include, but are not limited to the use and restriction, stress tolerance, and the environmental impact of lead; as well as the use of alternative materials and methodologies. The subjects also include the mechanical design and layout of telecommunications network equipment printed circuit assemblies and the components that are used in their construction.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, NIPP-NPP Pb-free Working Group Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, the NIPP-NPP Pb-free Working group, which is responsible for the development of this Standard, had the following members:
Trevor Bowers, ADTRAN
Kevin Bross, Intel
Marie Cole, IBM
Richard Coyle, Alcatel-Lucent
Eric Dornes, Southwest Research Institute
Lavanya Gopalakrishnan, Cisco
Gary Hazard, Tellabs
Paul Jacovelli, Fujitsu
Sherwin Kahn, Alcatel-Lucent
Bon Pipkin, AT&T
Nick Pitt, Nortel
Joe Smetana, Alcatel-Lucent
Pat Tobin, Fujitsu
Vasu Vasudevan, Intel

REVISION HISTORY

Date	Version	Description	Author
		Initial release	Pb-Free Working Group

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21. Scope, Purpose, & Application

21.1. Scope

This document specifies test methods and requirements for Pb-free Subassembly Modules. Module testing may be done on a representative part number, and is not required on all part numbers provided there is sufficient similarity in terms of size, component types, printed wiring board structure and materials, etc. Examples of modules include but are not limited to power supply modules and optics modules that are later added to a higher level assembly. This document exclusively focuses on those RoHS items specific to the introduction of Pb-free components and does not address requirements for device specific qualification.

21.2. Purpose

Telecom product that is eligible for the "Network Infrastructure Equipment" Pb- in-solder exemption (EU RoHS Directive exemption 7b) should continue to use subassembly modules manufactured using SnPb solder as referenced in GR-78-Core. The Telecom industry will not accept modules that use SnPb finished components but are soldered with Pb-free solders. In view of reliability concerns, the telecom users require qualification of RoHS6 subassembly modules (i.e. those assembled with Pb-free solder) as defined below. This document provides a set of methods and requirements for telecom industry qualification testing to determine acceptability of RoHS6 subassembly modules.

21.3. Application

This document (and supporting documentation) is intended to be used by equipment manufacturers wishing to deploy small modules in carrier network equipment when those modules use a solder composition other than the historical SnPb (tin-lead) solder.

22. Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this ATIS Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this ATIS Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IPC/JEDEC J-STD-020	Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices
GR-78-CORE	Generic Requirements for the Physical Design and Manufacture of Telecommunications Products and Equipment
JEDEC JESD-201	Environmental Acceptance Requirements For Tin Whisker Susceptibility Of Tin And Tin Alloy Surface Finishes
IPC/JEDEC JP002	Current Tin Whisker Theory And Mitigation Practices Guideline
JEDEC JESD22-B104	Mechanical Shock
IPC 9701	Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments
EU Directive 2002/95/EC	EU Directive for Restriction of Hazardous Substances (RoHS)
IPC J-STD-075	Classification of Non-IC Electronic Components for Assembly Processes
IPC-TM-650, Method 2.6.8	IPC Test Methods Manual, "Thermal Stress, Plated-Through Holes"

23. Definitions, Acronyms, & Abbreviations

23.1. Definitions

RoHS6

Refers to products or components that are RoHS compliant and do not contain Pb beyond the threshold limits permitted by the EU RoHS legislation. These products use Pb-free solders and components*.
**Note: For the purposes of this document, RoHS5 and RoHS6 are terms used to differentiate products that make use of various Pb exemptions and those that do not. OEM and supplier interpretation of the meanings of these terms can vary; for example, a Flip Chip BGA component with SnPb bumps and SnAgCu balls can be referred to as either RoHS5 or RoHS6.*

Module

Any electronic assembly consisting of components (mechanical and/or electrical) that is preassembled with solder alloys, with the purpose of being attached or connected to another soldered assembly at a later time.

Module Terminals

Module terminals refer to pins, leads, or balls on the module which interconnect the module to the next level Printed Circuit Board assembly.

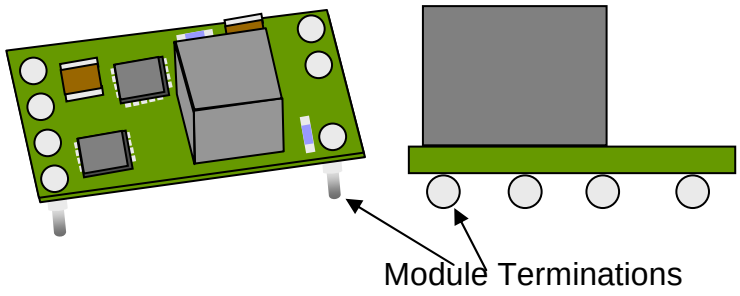


Figure 1: Example of Module Terminations

23.2. Acronyms, Abbreviations, & Symbols

ATIS	Alliance for Telecommunications Industry Solutions
RoHS	Restriction of Hazardous Substances
EU	European Union
Sn	Tin
Pb	Lead
BGA	Ball Grid Array
OEM	Original Equipment Manufacturer
Ag	Silver
Cu	Copper
SAC	SnAgCu (Tin-silver-copper)
Au	Gold
Ni	Nickel
Bi	Bismuth
SEM	Scanning Electron Microscopy
PCB	Printed Circuit Board
PWB	Printed Wiring Board
CGA	Column Grid Array
QFN	Quad Flat Pack No-Lead
MLF	Micro Lead Frame
LGA	Land Grid Array

24. REQUIREMENTS

24.1. For all components used internal to Pb-free (RoHS6) subassemblies

1) BGA's shall be compatible with the assembly process. Specifically, for Pb-free SnAgCu (SAC) assembly process, only BGA's with SAC solder balls are acceptable. Mixing of SnPb solder balls with SAC alloy solder is not acceptable.

2) Pb-free Sn finishes (including alloys such as SnAg, SnCu, SnBi) on leaded and discrete components shall only be used when these finishes include suitable whisker mitigation practices (see JEDEC JP002) and have passed the Class 2 tin whisker acceptance testing requirements of JEDEC JESD-201. Subassembly suppliers shall require this of their component suppliers and shall maintain an auditable process to ensure compliance with this requirement.

24.2. For subassembly modules meeting Pb-free (RoHS6) requirements

These subassemblies are RoHS6 modules with Pb-free module terminals, and the module is assembled using Pb-free solder and processes.

1) Plated leads or pins (the module terminals) which will be attached to the Printed Circuit Board assembly must be backward compatible with the SnPb assembly processes.

2) If the plated leads or pins used on the module terminal are Pb-free Sn finishes (including alloys such as SnAg, SnCu, SnBi, SnAgCu), the supplier shall use a suitable tin whisker mitigation practice (see JEDEC JEP002) and provide data demonstrating compliance with the Class 2 tin whisker acceptance testing requirements of JEDEC JESD-201.

3) The MSL rating of the module (per IPC/JEDEC J-STD-020) shall be based on the worst case MSL rated component used in the module. MSL rating should be provided for SnPb and SAC assembly as applicable to the module. Additionally, the module shall meet the temperature requirements of IPC/JEDEC J-STD-020 (revision C or later) for the appropriate SnPb and/or SAC assembly process if the module is to be SMT mounted.

4) Printed wiring boards internal to the module shall be manufactured using materials compatible with and qualified for high temperature Pb-free soldering. Qualification testing must be completed for each material/supplier combination and PCB construction per the IPC-TM-650 Method 2.6.8 "Thermal Stress, Plated-Through Holes" standard for 6X stress cycles. Areas cross-sectioned for validation must contain the tightest array of holes within the PCB. Note: It it the intent that the test method referenced here be changed to 2.6.27B upon it's release and review by the PWG committee.

5) For modules with solder ball terminals, the ball material specified should ideally be compatible with the solder process used during next level assembly of the printed circuit board assembly. For guidance on mixed alloy assembly (e.g. SAC ball and SnPb solder), refer to Telcordia GR-78-CORE.

6) All components used internal to the module shall meet J-STD-020 and/or J-STD-075. The module itself shall meet the temperature and MSL requirements of J-STD-020.

7) Solder joint reliability data (per IPC-9701) shall be required if any of the following subcomponents are used: ceramic BGAs or copper CGAs; leadless area array components (such as QFN, MLF, LGA, etc); BGAs with pitch less than or equal to 0.8mm; discretes greater than or equal to 2512 body size.

8) Telecommunications Infrastructure products require very long field lifetimes typically ranging from 15 to 25 years and high reliability. There are still significant unknowns relative to SAC solder joint reliability. Additionally, the greater stiffness of Pb-free solders, compared to SnPb solders, places greater stresses on the interfaces of solder joints to components and PCB's. Areas of particular concern include pad cratering, intermetallic fractures, particularly on NiAu surfaces, microvoiding, and copper voiding that may weaken the interfaces. The following figures provide examples of some of these phenomena. (Note: the copper voiding is not exclusive to Pb-free solders, but the added stiffness of Pb-free solders creates additional stresses on these interfaces should this voiding occur.)

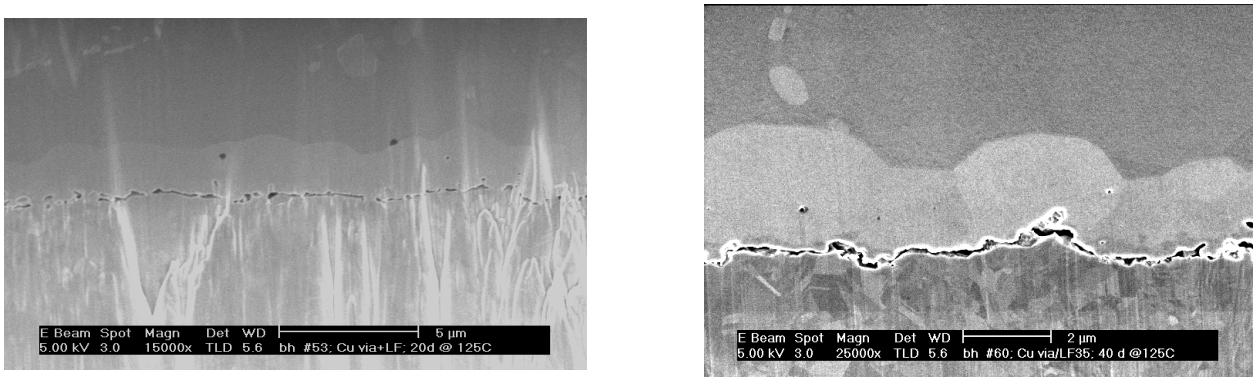


Figure 2: Example of Copper Voiding at Cu/Cu_3Sn Interface: Left, after 20 days at 125℃. Right, after 40 days @125℃. (Source: Texas Instruments)

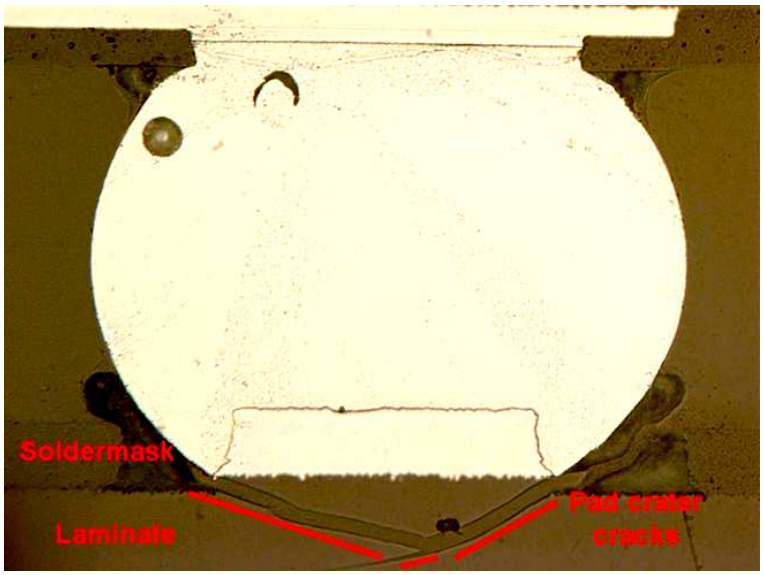


Figure 3: Example of Pad Cratering

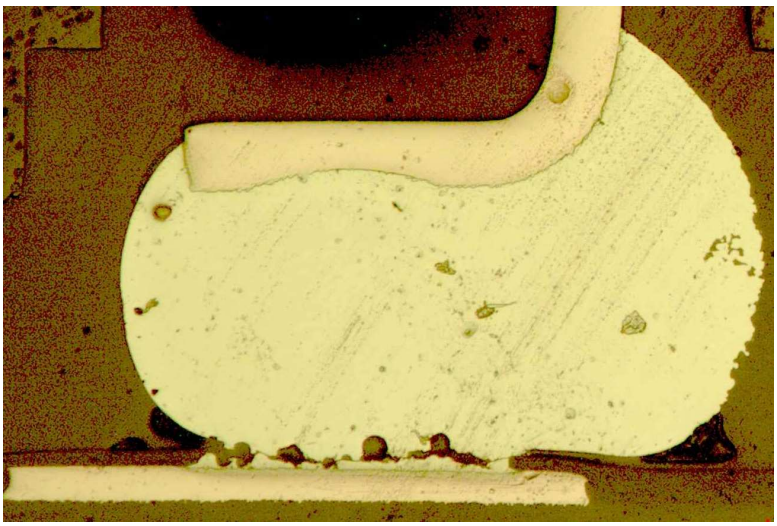


Figure 4: Example of solder cracking though voids

For long life products (does not apply to short life products like disc drives and similar) to minimize the risk to the product lifetime, in addition to the suppliers normal qualification testing, suppliers shall age the product a minimum of 750 hours at 125°C. If there are components (e.g. optical components that are inseparable from the module) that cannot tolerate 125°C, then the preconditioning shall be 2000 hours at 85°C. At the completion of this aging period, the module shall be subject to a mechanical shock test in accordance with JEDEC JESD22-B104 {latest rev}, service condition A. A minimum of 10 modules shall be subjected to this testing. At the end of the shock test, all modules shall be functionally tested. If failures occur, failure analysis shall be performed. The test is acceptable as long as the failures are not attributed to the defects as detailed above or specifically related to the Pb-free aspects of the design. Whether or not there are failures, a cross section of the solder joints of the largest BGA (if applicable), or otherwise largest SMT component in one of the tested modules shall be completed and examined by SEM for evidence of these types of failures. If these types of failure are identified, the test is a failure, and the modules are not acceptable until appropriate corrective actions are taken and verified as successful.

24.3. Associated Checklist

The following checklist is based on the above and shall be filled out as applicable for any modules being submitted for review in conjunction with this requirement.

1) For all the leaded IC and discrete components (not including BGA, QFN) used in the module, that use some form of Tin (Sn) finish (example finishes include Sn, SnAg, SnCu, SnBi, etc.) as the Pb-free surface finish of the component: Has the supplier performed suitable Sn whisker mitigation practices (see JEDEC JP002) and has the finish passed the Sn whisker acceptance testing requirements of JEDEC JESD-201 Class 2?

_____

2) Does the module supplier maintain a traceable and auditable record during their components supplier qualification to ensure the above Sn whisker mitigation practices and requirements are met?

_____

3) If the module's external leads or pins are finished with a Tin (Sn) or Sn alloy: Has the supplier performed suitable Sn Whisker mitigation practices (see JEDEC JP002) and has the finish passed the Sn whisker acceptance testing requirements of JEDEC JESD-201 Class 2?

_____

4) For all Surface Mount attached modules; is the MSL (Moisture Sensitivity Level per IPC/JEDEC J-STD-020) rating of the module based on the worst case MSL rated component used in the module?

_____

5) Do all the components used internal to the module and the module itself meet the temperature and MSL requirements of the J-STD-020 and/or J-STD-075 standards?

_____

6) Does the Printed Wiring Board (PWB) in the module use materials compatible with and qualified for high temperature Pb-free soldering?

_____

7) Has the preconditioing called out in Section 4.2, item (8) been completed? _____

8) Have the required shock tests of all modules in accordance with JEDEC JESD22-B104 service condition A been completed after preconditioning?

_____

9) After the shock test defined above, were all modules functionally tested and passed?

_____

10) Has failure analysis of any failed modules been completed and the failed components and root cause (s) been identified?

_____

11) Has detailed SEM examination of the passing modules to ensure there is no evidence of voiding in the intermetallic, pad cratering, excessive solder voids, or other similar defects been completed? A summary report detailing items 8-11 of this checklist shall be provided.

12) Does the module include any of the following technologies?
a) Array packages equal to or less than 0.8mm pitch

_____

b) Ceramic BGA or CuCGA component

_____

c) Leadless area array component, e.g. QFN, MLF, LGA, etc.
d) Passives of case size 2512 or larger

_____

13) If the answer to any item in 12 is yes, has solder joint reliability evaluation per IPC-9701 on the technology component type(s) been completed?

_____

24.4. Draftt: ATIS Standard on PB-free Circuit Packs

NIPP-NPP-2008-091

ATIS Standard on

TEST REQUIREMENTS FOR PB-FREE CIRCUIT PACKS

Secretariat
Alliance for Telecommunications Industry Solutions

Approved Month DD, YYYY

Abstract
Abstract text here.

25. Foreword

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The NIPP-NPP Pb-free Working Group proposes, develops, and recommends Standards and Technical Reports relating to the use of lead or the restriction of lead in solder used in the manufacturing of telecommunications network equipment. In addition, the group recommends positions on matters, within its scope of expertise, under consideration by other national, regional and international standards development organizations. The subjects of the NIPP-NPP Pb-free Working Group's Standards and Technical Reports include, but are not limited to the use and restriction, stress tolerance, and the environmental impact of lead; as well as the use of alternative materials and methodologies. The subjects also include the mechanical design and layout of telecommunications network equipment printed circuit assemblies and the components that are used in their construction.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, NIPP-NPP Pb-free Working Group Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, the NIPP-NPP Pb-free Working group, which is responsible for the development of this Standard, had the following members:
Trevor Bowers, ADTRAN
Kevin Bross, Intel
Marie Cole, IBM
Richard Coyle, Alcatel-Lucent
Eric Dornes, Southwest Research Institute
Lavanya Gopalakrishnan, Cisco
Gary Hazard, Tellabs
Paul Jacovelli, Fujitsu
Sherwin Kahn, Alcatel-Lucent
Bon Pipkin, AT&T
Nick Pitt, Nortel
Joe Smetana, Alcatel-Lucent
Pat Tobin, Fujitsu
Vasu Vasudevan, Intel

The **Pb-Free Working Group (PWG)** Subcommittee was responsible for the development of this document.

26. Revision History

Date	Version	Description	Author

27. Table of Contents

28. Table of Figures

[INSERT]

29. Table of Tables

[INSERT]

30. 1 Scope, Purpose, & Application

30.1. 1.1 Scope

This document specifies Acceptance and Testing Requirements for Pb-free circuit packs. Circuit pack testing may be done on a representative product, and is not required on derivative circuit packs provided there is sufficient similarity in terms of size, component types, printed wiring board structure and materials, etc. This document exclusively focuses on those issues specific to Pb-free assembly and the introduction of Pb-free components into circuit packs, and does not address requirements for product specific qualification.

30.2. 1.2 Purpose

Telecom product that is eligible for the "Network Infrastructure Equipment" Pb-in-solder exemption (EU RoHS Directive exemption 7b) should continue to be manufactured using SnPb solder as referenced in GR-78-Core. In view of reliability concerns, telecom service providers require qualification of RoHS6 circuit packs (i.e. those assembled with Pb-free solder) as defined below. This document provides a set of methods and requirements for telecom industry qualification testing to determine acceptability of RoHS6 circuit packs.

30.3. 1.3 Application

This document (and supporting documentation) is intended to be used by equipment manufacturers wishing to deploy carrier network equipment when using a solder composition other than the historical SnPb (tin-lead) solder. For subassembly modules, e.g. optical modules, power modules, refer to ATIS Standard ?????? TEST REQUIREMENTS FOR PB-FREE SUBASSEMBLY MODULES.

31. 2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this ATIS Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this ATIS Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IPC/JEDEC J-STD-020	Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices
IPC/JEDEC J-STD-075	Classification of Non-IC Electronic Components for Assembly Processes
JEDEC JESD-201	Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes
IPC/JEDEC JP002	Current Tin Whisker Theory and Mitigation Practices Guideline
EU Directive 2002/95/EC	EU Directive for Restriction of Hazardous Substances (RoHS)
GR-63-Core	NEBS™ Requirements: Physical Protection Editor's note: keep or omit this reference???
GR-78-CORE	Generic Requirements for the Physical Design and Manufacture of Telecommunications Products and Equipment

IPC 9701	Performance Test Methods and Qualification Requirements for Surface Mount Solder Attachments
IEC 60068–2–27	Basic Environmental Testing Procedures Part 2, Test Ea and Guidance, Shock
NAVMAT P-9492	Navy Manufacturing Screening Program

32. 3 Definitions, Acronyms, & Abbreviations

32.1. 3.1 Definitions

3.1.1 RoHS6 – Refers to products or components that are RoHS compliant and do not contain Pb beyond the threshold limits permitted by the Eu RoHS legislation. These products use Pb-free solders and components*.
**Note: RoHS5 and RoHS6 are general industry terms often used to differentiate between products that make use of various Pb exemptions and those that do not. OEM and supplier interpretation of the meanings of these terms can vary; for example, a Flip Chip BGA component with SnPb bumps and SnAgCu balls can be referred to as either RoHS5 or RoHS6.*

32.2. 3.2 Acronyms, Abbreviations, & Symbols

ATIS	Alliance for Telecommunications Industry Solutions
RoHS	Restriction of Hazardous Substances
EU	European Union
Sn	Tin
Pb	Lead
BGA	Ball Grid Array
OEM	Original Equipment Manufacturer
Ag	Silver
Cu	Copper
SAC	SnAgCu (Tin-silver-copper)
Au	Gold
Ni	Nickel
Bi	Bismuth
SEM	Scanning Electron Microscopy
PCB	Printed Circuit Board
PWB	Printed Wiring Board
CGA	Ceramic Grid Array
QFN	Quad Flat Pack No-Lead
MLF	Micro Lead Frame
LGA	Land Grid Array

33. 4 Requirements:

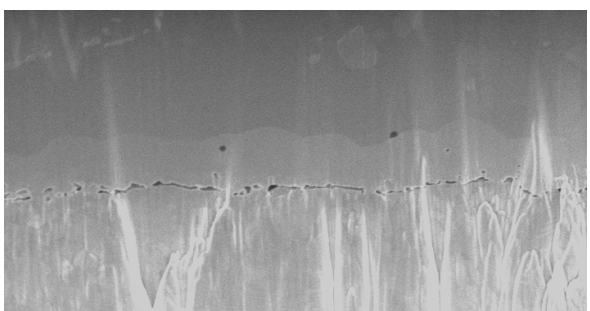
33.1. 4.1. For all components used on RoHS6 assemblies

1) BGA's shall be compatible with the assembly process. Specifically, for Pb-free SnAgCu (SAC) assembly process, only BGA's with SAC solder balls are acceptable. Mixing of SnPb solder balls with SAC alloy solder is not acceptable.
2) Pb-free Sn finishes (including alloys such as SnAg, SnCu, SnBi) on leaded and discrete components shall only be used when these finishes include suitable whisker mitigation practices (see JEDEC JP002) and have passed the Class 2 tin whisker acceptance testing requirements of JEDEC JESD-201.

4.2 For RoHS6 assemblies

Defined as an assembly which is built with Pb-free solder and processes.

1) Printed wiring boards shall be manufactured using materials compatible with and qualified for high temperature Pb-free soldering. Qualification testing must be completed for each material/supplier combination and PCB construction per the IPC-TM-650 Method 2.6.8 "Thermal Stress, Plated Through Holes" standard for 6X stress cycles. Areas cross-sectioned for validation must contain the tightest array of holes within the PCB. Note: It it the intent that the test method referenced here be changed to 2.6.27B upon it's release and review by the PWG committee.
2) All components shall meet J-STD-020 and/or J-STD-075.
3) Solder joint reliability data (per IPC-9701) shall be required if any of the following components are used: ceramic BGAs or copper CGAs; leadless area array components (such as QFN, MLF, LGA, etc); BGAs with pitch less than or equal to 0.8mm; discretes greater than or equal to 2512 body size.
4) Telecommunications Infrastructure products require very long field lifetimes typically ranging from 15 to 25 years and high reliability. There are still significant unknowns relative to SAC solder joint reliability. Additionally, the greater stiffness of Pb-free solders, compared to SnPb solders, places greater stresses on the interfaces of solder joints to components and PCB's. Areas of particular concern include pad cratering, intermetallic fractures, particularly on NiAu surfaces, microvoiding, and copper voiding that may weaken the interfaces. Figures 1 through 3 provide examples of some of these phenomena. (Note: the copper voiding is not exclusive to Pb-free solders, but the added stiffness of Pb-free solders creates additional stresses on these interfaces should this voiding occur.)



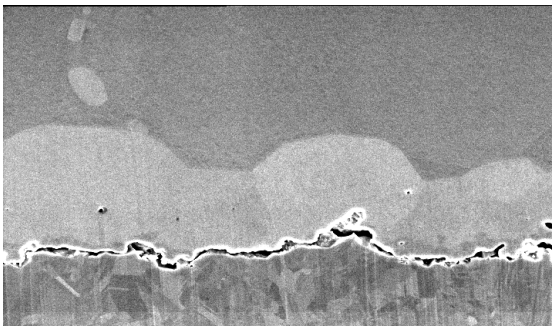
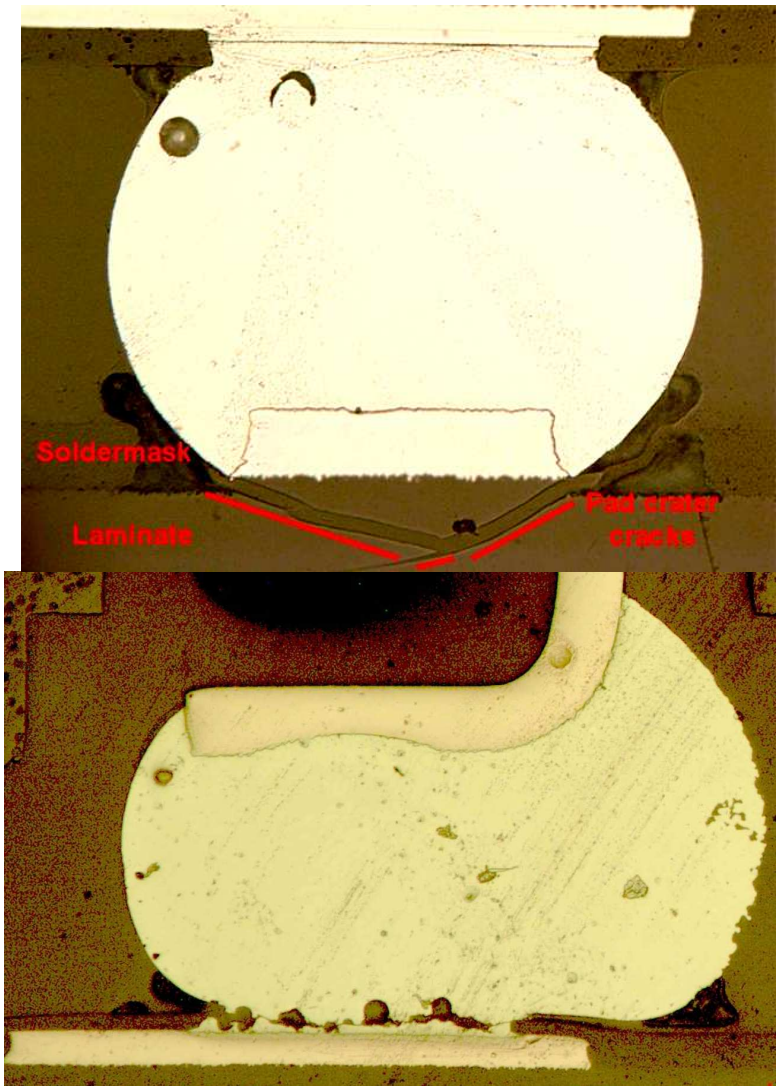


Figure 1: Example of Copper Voiding at Cu/Cu_3Sn Interface: Left, after 20 days at 125°C. Right, after 40 days @125°C. (Source: Texas Instruments)



To minimize the risk to the products, in addition to the supplier's normal qualification testing, suppliers shall perform the following series of tests as shown in Figure 4 and explained further below. These tests are designed to stress the assembly to the extremes or possibly slightly greater than actual use conditions to identify any weaknesses associated with the Pb-free assemblies. Three complete functional assemblies shall be used in this testing.

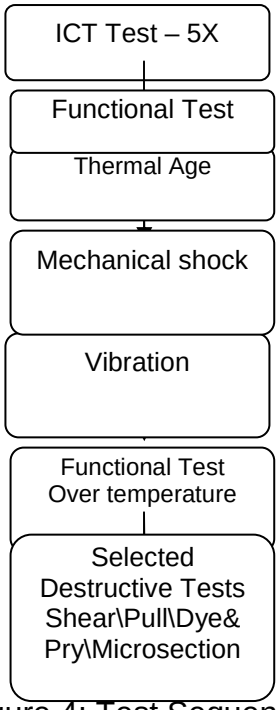


Figure 4: Test Sequence

4.2.1 Test Sequence Details (refer to Figure 4)
The purpose of this testing is to expose problems related to Pb-free solder joints and/or material weaknesses associated with the higher temperatures of Pb-free solder processes. It follows that testing should ideally be done at the circuit pack level. However, testing over temperature shall be done at the lowest assembly level at which full functional testing may be conducted.

ICT Test: This is a standard In-Circuit-Test, and is applicable only if the assembly is ICT tested as part of the normal process. In-Circuit-Tests place mechanical shock and flexing on the circuit boards as the fixtures are cycled. It shall be repeated a minimum of 5 times to represent a worst case for testing including repairs and multiple tests.
Functional Test: This is the standard functional electrical test for the assembly. This test is designed to ensure that the unit is functioning normally prior to the remaining testing.
Thermal Age: The assemblies shall be placed in a chamber at 125ºC for 240 Hours (10 days)

to precondition the assemblies prior to additional testing. If the assembly contains components which cannot tolerate 125℃, then the preconditioni ng shall be 480 hours at 85℃. Pb-free solders physical properties (such as creep) are known to change with aging.

Mechanical Shock: Mechanical Shock Testing shall be completed per IEC 60068–2–27 with the following parameters;

Pulse shape: half-sine
300 m/s^2 (30g)
10 ms
6 directions
3 shocks per direction

Vibration: Random Vibration shall be tested per NAVMAT P-9492 at 6g RMS for a duration of 30 minutes.

Functional Test over Temperature: This is the standard functional electrical test for the assembly except that it shall be run over the complete temperature range that the product is intended for use (typically 0-50ºC for Central Office/Indoor Products and -40 to +70ºC for Outdoor products). The product shall be functional tested continually during the thermal excursion and a minimum of four temperature cycles shall be run with minimum dwell times at the extreme temperature of one hour. At this point these assemblies should be functional. If any failures are identified, failure analysis is required and appropriate corrective actions shall be determined and implemented. It may be necessary to repeat this series of tests after these corrective actions are in place.

Selective Destructive Tests: After the assemblies have completed all the required testing, destructive physical analysis is required on representative areas of the assemblies. This should include Dye and Pry Tests (on BGA's for example) and crossections of solder joints. Pull testing of discrete components and/or IC leads should also be done to ascertain the quality of the assembly soldering process. These should be distributed between the three assemblies. As every assembly is unique it is impossible to detail exactly what components and tests are required here. Suppliers shall complete a detailed report of the findings including a rationale behind the test selections. Failures identified in these destructive tests may be acceptable provided the failures are not attributed to the defects as detailed above or other defects specifically related to the Pb-free assembly of the product. If failures are identified which are associated with Pb-free solders or processes, the test is a failure, and the assemblies are not acceptable until appropriate corrective actions are taken and testing has been successfully completed.

4.3 Associated Checklist

The following checklist is based on the above and shall be filled out as applicable for any modules being submitted for review in conjunction with this requirement.

1) For all leaded IC and discrete components (not including BGA, QFN) that use some form of tin (Sn) finish (example finishes include Sn, SnAg, SnCu, SnBi, etc.) as the Pb-free surface finish of the component: Has the component supplier performed suitable Sn whisker mitigation practices (see JEDEC JP002) and has the finish passed the Sn whisker acceptance testing requirements of JEDEC JESD-201 Class 2?

_____

2) Does the supplier maintain a traceable and auditable record during their components qualification to ensure the above Sn whisker mitigation practices and requirements are met?

_____

3) Do all the components used meet the temperature and MSL requirements of the J-STD-020 and/or J-STD-075 standards?

_____

3) 4) Does the Printed Wiring Board (PWB) use materials compatible with and qualified for high temperature Pb-free soldering?

_____

4) Has the required testing of section 4.2.1 been completed? Please provide summary report detailing the testing and results.

_____

5) Has failure analysis of any failed assemblies been completed and the failed components and root cause (s) been identified?

_____

6) Has detailed SEM examination of the passing modules to ensure there is no evidence of voiding in the intermetallic, pad cratering, excessive solder voids, or other similar defects been completed?

_____

Additional information for evaluating the risk of the assembly

7) Does the assembly include any of the following technologies?

   a) Array packages equal to or less than 0.8mm pitch

   _____

   b) Ceramic BGA or CuCGA component

   _____

   c) Discrete components greater than or equal to 2512 size

   _____

   d) Leadless area array component; such as QFN, MLF, LGA, etc.

_____

8) If the answer to any item in 8 is yes, has solder joint reliability evaluation per IPC9701 on the technology component type(s) been completed?

_____

1. APPENDIX E: Purposed Energy Efficiency

NIPP-TEE-2008-028R2

NIPP
SUB Committee TEE

August 13, 2008

Draft Standard

TITLE: Energy Efficiency Working Draft
SOURCE*: Editor, Jeff Whitmire, ADTRAN
PROJECT: NIPP TEE Telecommunications Energy Efficiency

_____

_____

2.

3.

4. ABSTRACT: Working Draft – Base Standard on Energy Efficiency for telecommunication equipment.

5.

ATIS 0X0000X

ATIS-0600015.2008

American National Standard for Telecommunications

ENERGY EFFICIENCY FOR TELECOMMUNICATION EQUIPMENT: METHODOLOGY FOR MEASUREMENT AND REPORTING GENERAL REQUIREMENTS

Secretariat
Alliance for Telecommunications Industry Solutions

Approved Month DD, YYYY
American National Standards Institute, Inc.

Abstract
Abstract text here.

6. Foreword

The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The NIPP-TEE Committee [**INSERT MISSION**]. [**INSERT SCOPE**].

ANSI guidelines specify two categories of requirements: mandatory and recommendation. The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, NIPP-TEE Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, NIPP-TEE, which is responsible for the development of this Standard, had the following members:

J. Messina, NIPP-TEE Chair

M. Elkenaney, NIPP-TEE Vice-Chair

[**COMMITTEE LIST**]

The **[SUBCOMMITTEE NAME]** Subcommittee was responsible for the development of this document.

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[INSERT]

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*10.*1 Scope, Purpose, & Application

10.1. 1.1 Scope

This document provides the methodology to be used by vendors and third party independent laboratories in the formation of a telecommunications energy efficiency ratio (TEER). This document is the base standard for determining telecommunications energy efficiency. Supplemental standards to this general document will provide specific details on configurations, TEER formulas and other pertinent details for formulating the TEER value for the specific types of equipment. This document is considered applicable to DC-powered network equipment to be deployed in controlled environments. This standard does not apply to network equipment that is designed to be solely utilized in an outside plant cabinet/enclosure.
AC powered equipment and outside plant equipment is considered outside the scope of this standard at this time and may be added as a later revision to this standard.
The initial document scope is modest to start with the intention of refining the data to be provided, the measurement methods and the reporting format over time.
The intent of this document, in conjunction with the associated supplemental standards, is to create a uniform method for measuring telecommunication equipment energy consumption (power) as well as establishing efficiency metrics and reporting methods.

10.2. 1.2 Purpose

This document provides a uniform methodology to measure equipment power and define energy efficiency ratings for telecommunication equipment. This document serves as the base standard for all supplemental ATIS-0600015.xx standards. This is a living document and is expected to evolve with new technologies and equipment trends.

10.3. 1.3 Application

This standard is intended to standardize the test methodology, environmental factors and utilization of the equipment for measuring the energy used in the formation of the telecommunications energy efficiency rating. The specified procedures are intended to be applied in a controlled laboratory environment. Testing is to be performed at an independent test laboratory. Vendor supplied supplemental data can also be submitted to account for different configurations then those tested by the independent test laboratory.

11. 2 Normative References

The following standards contain provisions, which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

T1.xxx-YYYY, *Title*.[5]

12. 3 Definitions, Acronyms, & Abbreviations

3.1 Definitions

3.1.2 **P_x:** The measured power of the system at x% traffic load.

3.1.3 **P_{TEER}:** The system power used for the TEER calculation.

3.1.4 **Minimum Supported State (MSS):** The minimum supported configuration that a vendor would support, including the minimum amount of software to stabilize the system (e.g. Shelf common equipment with redundancy where required and fans).

3.1.5 **Declared TEER –** TEER value stated by an equipment manufacturer. This may be directly measured or calculated by the vendor.

3.1.6 **Certified TEER –** TEER value determined by measurements performed or witnessed by a Third Party Test Laboratory.

3.1.7 **Demarcation Point** - (demarc) That point at which operational control or ownership of communications facilities changes from one organizational entity to another. *Note:* The demarcation point is usually the interface point between customer-premises equipment and external network service provider equipment.

3.1.8 **Throughput** – The number of bits, characters, or blocks passing through a data communication system, or portion of that system.

3.1.9 **Third Party Test Laboratory –** An independent test laboratory that is accredited to ISO/IEC 17025.

3.1.10 **Network Terminating Equipment (NTE)** - Network Terminating Equipment. NTE is a general term applied to equipment terminating a network connection. For example, NTE may terminate an access circuit, converting the information to a form used by the CPE.

12.1. 3.2 Acronyms & Abbreviations

ATIS	Alliance for Telecommunications Industry Solutions
MSS	Minimum Supported State
NEBS	Network Equipment Building Systems
TEER	Telecommunications Energy Efficiency Ratio

[5] This document is available from the Alliance for Telecommunications Industry Solutions, 1200 G Street N.W., Suite 500, Washington, DC 20005. <http://www.atis.org>

13. 4 Equipment Classification

Equipment may be classified based on the application and the location in the network. The following equipment classifications are provided to support a common definition for equipment measurements.

13.1. 4.1 Equipment Type

4.1.1 Core Equipment

Core equipment provides support for the network features and telecommunication services. The support provided includes functionality such as the management of user location information, control of network features and services, the transfer (switching and transmission) mechanisms for signaling and for user generated information. (adapted from **3GPP TS 23.101)**

4.1.2 Transport Equipment

Transport equipment enables information transfer capabilities between originating and terminating access service facilities.

4.1.3 Access Equipment

Equipment whose purpose is to connect the core or transport network to the end user. This may be equipment used to transmit data from the core network to a node within the network. This may also be equipment that transmits data from the core or node to the end user's demarcation point. NTE is included within Access Equipment.

4.1.5 Customer Premise Equipment (CPE)

Equipment located on the customer's side of the demarcation point that is used as a part of the premise network. Examples of CPE include but are not limited to modems, broadband home routers, power adapters and set top boxes. For the purpose of this family of standards NTE is not considered CPE.

4.1.6 Power Equipment

Power conditioning equipment including telecommunications type recitifiers, converters, and inverters.

14. 5 Measurements

14.1. 5.1 Power Measurements

Accurate measurements of energy consumed, by a given piece of equipment, is critical in determining the overall energy efficiency for that product. Insufficient sample intervals and measurement durations can lead to power measurements errors. Use of a power analyzer (or equipment with equivalent capability and accuracy) is required for measuring the energy consumption of a given piece of equipment.
Within this standard the AC component on DC powered equipment not considered significant for equipment that conforms to the DC power and electromagnetic noise requirements of ATIS-0600315.2007 .
All equipment used for taking physical measurements shall be in a current state of calibration traceable to NIST requirements or counterpart national metrology institute in other countries.

14.2. 5.2 Environmental Considerations

14.3.

5.1.1 Temperature

The equipment shall be evaluated at temperature of 25°C ±3°C.

5.1.2 Humidity

The equipment shall be evaluated at a relative humidity of 30% to 75%.

5.1.3 Barometric Pressure

The equipment shall be evaluated at a barometric pressure between 1020 and 812 mbar. This corresponds to typical pressure between an altitude of 6000ft (1829m) above sea level to 197ft (60m) below sea level..

5.1.4 Voltage

The equipment shall be evaluated at a DC voltage of –53V ±1V. (This level is consistent with the voltage defined in ATIS-0600315.2007 for a -48 V_{dc} powering system.)
Equipment using voltages other than -48Vdc shall be evaluated at ±2% of the nominal voltage. Where applicable the typical steady state voltage as defined in ATIS-0600315.2007 shall be used.

5.2 Power Measurement Equipment

The measurement equipment used to measure voltage and current for the purposes of determining energy, or power for the equipment under test shall have the following minimum characteristics.

- A minimum digitizing sample rate of 40kHz
- Input circuitry with a minimum bandwidth of 80kHz
- Ability to log data over time and store the total measurement period
- Overall measurement tolerance shall be within +/- 1%

Measurements may be performed with a variety of instruments. These range from voltage and current meters with data acquisition capability to power analyzers capable of fully integrated measurement.
Note: Measurement equipment with higher digitizing rates and higher accuracy may be desirable to ensure accurate measurement.

5.3 Power Source

DC power sources used to provide power to the equipment under test shall be capable of providing a minimum of 1.5 times the power rating of the equipment under test.

5.4 Equipment Stabilization

Equipment shall be allowed to stabilize and then operate for a minimum of 15 minutes before measurements can be taken.

5.5 Minimum Measurement Duration

Measurements of the input energy shall be performed over a minimum period of 5 minutes. For equipment whose cycle time or energy saving mode requires a longer measurement period, the minimum measurement period shall be increased to provide an accurate indication of input energy.

5.6 Test Configuration

EUT with multiple power connections (including redundant connections) shall have all feeds connected and the power flow from all feeds summed to obtain total system power.
Within this document, the typical environment in a Central Office is considered to be 27°C. The power used by fans may be higher when operating at 27°C rather than at lower temperatures. The data reported for the equipment shall represent fan power expected when the equipment is operating in a simulated environment of 27°C at sea level. To capture this potential higher power use the following methods may be used.

- Test in a thermally controlled environment of no less than 27°C.
- If fans are configurable, they shall be configured with speed settings representative of an

operating environment of 27°C at sea level.

- If fans are not configurable a fan speed adjustment must be added to the measured system power. With a modular system, the power from the fans may be evaluated once and incorporated in the data matrix.

NOTE: Non-Configurable adjustments shall be identified within the test report.
Traffic shall flow throughout the system and shall exercise all features and functions for the specific type of equipment. Traffic parameters shall be defined in each supplemental standard.

5.7 Energy Measurements

Measurements shall be performed for traffic conditions (line rate, profile, pattern etc.) specific to the equipment. For each traffic condition, power measurements shall be averaged over the recommended test interval. The supplemental standards will further define the traffic conditions and requirements for equipment. Examples of traffic conditions include but are not limited to 0%, 50%, 100%.
All energy measurements shall be taken at the main system power input (incorporating all operational modules).
An additional measurement will be performed at a Minimum Supported State (MSS) and reported. For some customers this measurement provides useful information. The MSS data is not included in the efficiency calculation. The definition of MSS will be further clarified within the supplemental standard.

5.7.1 Weighted Rating

The power measured from the applicable traffic conditions shall be weighted in the calculation of P_{Total} as defined in the appropriate supplemental standard.

5.8 Non-Modular System

In this type of system, all modules/ports are integrated with the chassis as one system and the configuration can not be changed. The use of pluggable interfaces including, but not limited to SFP's, cable termination, GPIC, X2, XENPAK, power supplies is typically considered non-modular. There may exceptions identified in the supplemental standards.

5.9 Modular System

A design concept in which interchangeable units are used to create a functional end product. Energy measurements may be taken on a module basis in order to determine the individual power consumption of each component of the system. The individual components power consumption will then be combined to determine the overall power consumption of the system. Modular systems may be measured in a typical configuration which represent a family of products. Vendors may designate one or more configurations of their modular systems as "typical configurations" and designate TEER ratings for those systems. Additional guidance will be provided in supplemental standards.

15.7 Telecommunications Energy Efficiency Ratio (TEER)

TEER is the ratio of useful work over Power. Useful work and Power will be derived in the associated supplemental standard. The following guidelines will be followed when defining TEER for equipment.

- The scale will be fully defined in the supplemental standards such that typical TEER values range from 1 to 1000.
- The higher the TEER value, the more energy efficient the equipment is compared to other like equipment.
- The supplemental standard will define the TEER calculation details.

In general each TEER will follow the formula below.

$$TEER = \frac{UsefulWork}{P_{TEER}}$$

For Example, the following is the TEER formula from the supplemental standard for Transport equipment.

$$TEER = \frac{D_{TEER}}{P_{TEER}}$$

Where:

D_{TEER} = Useful Work = Data Rate in Mbit per second.
P_{TEER} = Power in Watts

*16.*8 Reporting

An example of a test reporting form is provided in Appendix A. A test report shall be prepared that contains the following minimum information:

- Any relevant supplemental standard used.
- Date and location of test
- Physical equipment configuration.
- Software Version operating on system
- Activated features and functions during testing
- Explanation of configuration chosen/tested
- Method used to validate stated traffic flow under specified conditions. For example, describe how the laboratory verified that the recommended traffic patterns met the conditions of the test plan.
- Support equipment used to verify operation of equipment
- Description of test equipment used for making measurements with calibration dates
- A block diagram with connection information. It is recommended that traffic flow be indicated.
- Energy measurement results for all applicable test conditions as defined in the relevant supplemental standard. (MSS, Maximum, alternate configurations, etc)
- Duration of actual energy measurement tests.
- Identification of environmental conditions of as defined in Section 5.1
- Telecommunication Energy Efficiency Rating (TEER)
- Report of any engineering judgment used during the evaluation

NOTES:

- It may be useful to store relevant raw test data.
- Annex A (Informative) provides an example of a data report.

Annex A (Informative)

Telecommunications Energy Efficiency Ratio Reporting Form Example

Product:	Super Switch	Base Standard:	ATIS-0600014.2008
Test Sponsor:	Acme	Supplemental Standard	ATIS-0600014.01.2008
Tested By:	Testing Labs	Test Date:	June 15, 2008
Test Location:	Somewhere, NA	Publication Date:	June 30, 2008
TEER Type	Declared/Certified	Declared TEER Information	Tabulated based on individual card measurements
TEER Rating	725		

System Under Test	
Hardware	
Description:	6U OC-3 Switch (Model Super Switch)
	336 Single-mode LC-type OC-3 connectors
Fan Compensation Power	
Modifications required	
Software	
Firmware version::	4.02c
Boot loader version:	1.15
Configuration Notes and Software Tuning Parameters:	
Configuration Notes:	System connected to 30 SONETBlaster XYZ SONET traffic generators
Software Tuning Parameters:	System Under Test set to factory defaults. Virus scanning and encryption features disabled for this test.
Annotated Picture of System Under Test	
<insert picture of test system here, with significant items identified by callouts in the picture>	

ATIS 0X0000X

Environmental Test Conditions		
Criteria	**Specified Conditions**	**Test Conditions**
Test Duration	Minimum 5 minutes	10 minutes
Ambient Temperature:	23℃ – 28℃	23.2℃
Relative Humidity:	30% - 75%	50%
Pressure:	1012 to 812 mbar	949 mbar
Feed Voltage:	-52 to -54 VDC	-53.0 VDC
Supply Power Rating	minimum1.5 time rated Power (1500 Watts for system under test)	3000 Watts
Energy Analyzer		
Hardware Vendor:	Power Analyzer	
Model:	Super Analyzer 1	
Serial Number:	9099909	
Calibration Institute	Cal Labs	
Accredited by:	NIST	
Calibration Label:	07-0001Q	
Calibration Date:	December 27, 2007	
Power Feed Sizing		
Minimum:	1A	at minimum supported system configuration
Maximum:	25A	at maximum supported system configuration
Total Power Feeds:	4	
Feed Redundancy:	2N (2+2)	
Contact Information Regarding This Report		
Name:	Jenny Doe	
Phone:	555-555-5555	
E-mail:	jennyt@tptltesting.com	
URL:	www.tptltesting.com	

Other notes:
Matrix for Modular System:

ATIS 0X0000X

NIPP-TEE-2008-031R4: ATIS-0600015.xx.2008

ATIS Standard on Transport Energy Efficiency

ENERGY EFFICIENCY FOR TELECOMMUNICATION EQUIPMENT: METHODOLOGY FOR MEASUREMENT AND REPORTING TRANSPORT REQUIREMENTS

Secretariat
Alliance for Telecommunications Industry Solutions

Approved Month DD, YYYY

Abstract
This document specifies the definition of Transport products and systems as well as a methodology to calculate the Telecommunication Energy Efficiency Ratio (TEER) of a transport system or network configuration. The standard will also provide requirements for how equipment vendors shall respond to a TEER request based on a specific application description by making use of relevant data from internal and independent test reports.

FOREWORD

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The <subcommittee/group mission/scope, etc.>

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, NIPP-NPP Pb-free Working Group Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, the <committee>, which is responsible for the development of this Standard, had the following members:
<Members>

REVISION HISTORY

Date	Version	Description	Author(s)
Aug/05/08	D0.1	Working draft	Detlef Hess (Nortel), Brian Hunck (Fujitsu), Jeff Holt (Fujitsu) Andrew Jarabek (Nortel)
Aug/08/08	D0.2	Minor updates to TEER example data and data rates in tables based on comments from Brain Hunck and Gary Hazard.	Updates by: Andrew Jarabek (Nortel)
Aug/11/08	D0.3	Added contribution number to the header. Minor updated to Section 4.2, (first sentence) and Section 4.2.3 (3rd paragraph) based on comments from Jeff Holt	Updates by: Andrew Jarabek (Nortel)
Aug/13/08	D0.4	Minor updates.	Updates by: Andrew Jarabek (Nortel)
Aug/14/08	D0.5	Incorporated updates and suggestions from NIPP-TEE committee from Aug 13 and 14th meetings.	Jeff Whitmire, Andrew Jarabek

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1. Scope, Purpose, & Application

1.1. Scope

This document provides the methodology to be used by vendors and third party independent laboratories in the formation of a telecommunications energy efficiency ratio. The requirements and definitions in this document are for the Transport class of products that are deployed in the telecommunications industry. This supplemental standard represents one part of the larger ATIS suite of standards concerning Telecommunications Energy Efficiency (ATIS-0600015.2008). This supplemental standard (ATIS-0600015.xx.2008) specifically addresses transport equipment and is to be used in conjunction with ATIS-0600015.2008.

The initial document scope is modest to start with the intention of refining the data to be provided, the measurement methods and the reporting format over time.

1.2. Purpose

This document provides a set of definitions, requirements and guidelines for calculating the Telecommunications Energy Efficiency Ratio (TEER) of a system or network configuration consisting of a given product or group of related or inter-connected products. The document will also provide standardized definitions of transport interface operational data rates and conditions to be used when calculating the TEER of any given configuration. The test methodology used to independently verify the power consumption used as part the TEER calculation is addressed in ATIS-0600015.2008.

1.3. Application

This document (and supporting documentation) is intended to be used by communication network operators, equipment manufacturers, suppliers and test laboratories as a standard method for determining the energy consumption required to address a specific application. By comparing the TEER reports of multiple configurations that meet a common set of requirements, a communications network operator can select equipment configuration that meets their energy consumption targets. In order to normalize the results, the network operator is required to specify the configuration details through an application description process.

2. Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this ATIS Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this ATIS Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Table 1: Normative References

Reference	Title
General Specification	ATIS-0600015.2008

Definitions, Acronyms, & Abbreviations

2.1. Definitions

Table 2: Definitions

Term	Definition
TEER	Telecommunications Energy Efficiency Ratio

2.2. Acronyms & Abbreviations

Table 3: Acronyms and Abbreviations

Acronym	Expansion

ADM	Add/Drop Multiplexer
DWDM	Dense Wave Division Multiplexing
OTN	Optical Transport Network
ROADM	Reconfigurable Optical Add/Drop Muliplexer
SDH	Synchronous Digital Hierarchy
SONET	Synchronous Optical Network
TDM	Time Division Multiplexing
WDM	Wave Division Multiplexing

3. Equipment Description

3.1. Transport Equipment

Transport products are carrier owned and typically reside in central office and other restricted access environments.
The Transport category includes products which provide connectivity across a local, metro, or long-haul area. Transport products may perform electrical, optical, or point-to-point wireless transmission; the multiplexing or aggregation of lower rate circuits or flows into higher rate circuits or flows; or cross-connection of circuits or flows.
Transport category equipment may be located in a central office, co-location area, outside plant cabinet, controlled environment vault, customer located telecommunications closet, customer located indoor cabinet, or any similar location. In all cases, Transport category equipment is owned by the carrier.
Examples of Transport category equipment include, but are not limited to:

- SONET/SDH ADMs, MSPP, and similar equipment
- "OTN" (Optical Transport Network) equipment
- Digital Cross Connect Systems (DCS)
- ROADM/WDM and similar equipment
- Video transport equipment
- Storage area networking equipment
- Free space optics
- Point-to-point wireless transport (eg. Microwave)

4. Metric Definition

4.1. Preamble

Today's transport products are multi-service. A single chassis can simultaneously support a variety of circuit packs addressing everything from Layer 0 photonic/wavelength switching, Layer 1 time division multiplexed (TDM) switching, Layer 2 packet processing and more.
Typically, a system consists of a chassis or shelf with multiple slots that can be equipped with a variety of modules and as a result a system can be configured in tens or even hundreds of ways. Consequently there could be as many TEER reports for a given chassis-based system as there are ways of configuring it. Furthermore, in order to provide flexibility and scalability, some systems can be extended by adding shelves or external peripherals.
Therefore this standard will not define a single TEER, rather on a method for computing the ratio of the raw data rate (in Mbit/s) to power consumption (in Watts) for any desired configuration. In this manner, for a given transport networking scenario, multiple products or solutions can be evaluated. The metric can be used to evaluate the many possible configurations for one product as well as compare multiple products. The higher the TEER, the more efficient the solution is.
This standard also shows how the methodology can be extended to the calculation of the TEER of an entire network configuration.

4.2. Transport TEER

In order to accurately predict the system configuration power for any specified application, the equipment supplier must maintain a data base of module-level power consumption data such that the supplier can calculate and provide a TEER for any requested system configuration. This is known as a "declared TEER". Since it is not practical to independently test every module in every configuration, the power consumption of a subset of system configurations should be independently certified and those reports made available on request. A report a specific configuration that is supported by a certified power measurement report is known as a "certified TEER". For supplier declared TEER reports, the vendor should be prepared to report, on request, the percentage of power included in the TEER calculation that is contributed by modules which have been used in an independently certified configuration.

Declared TEER

In order to determine the TEER for a given transport equipment configuration, it must first be clearly expressed in a detailed application description including the following:

- The *n* required interfaces, for the application (listed as *i*=1 through *n*)
- The required networking interfacing protocol for each interface, *i*, type including the data rates in Mbit/s, *D*

Given the detailed description a configuration can be selected that meets the requested application. The required equipment and associated power is summarized with:

- A list of *m* discrete modules or groups of modules (listed as *j*=1 through *m*)
- The typical power consumption, *P*, expressed in Watts (W) of each module *m* required to build the specified application.

The TEER consists of the sum of the *n* interface data rates, D_n, divided by the sum of the power consumption of the *m* modules, P_m as expressed by the following formula:

$$TEER = \frac{D_{TEER}}{P_{TEER}} = \frac{\sum_{i=1}^{n} D_i}{\sum_{j=1}^{m} P_j}$$

When comparing systems that address the same application and data rate, a higher TEER indicates that less power is consumed to perform the function.

Certified TEER

For a certified TEER ($TEER_{CERT}$) the total data rate, D_{TEER}, is determined in the same manner as the declared TEER. Specifically, the application must be described in terms of:

- The *n* required interfaces, for the application (listed as *i*=1 through *n*)
- The required networking interfacing protocol for each interface, *i*, type including the data rates in Mbit/s, *D*

The specified application described must then be setup complete with live representative traffic on all the required interfaces and power measured in accordance with ATIS-0600015.2008. In a certified TEER, the actual measured power, P_{TEER_CERT} shall be used for P_{TEER} as expressed by the following formula:

$$TEER_{CERT} = \frac{D_{TEER}}{P_{TEER}} = \frac{\sum_{i=1}^{n} D_i}{P_{TEER\_CERT}}$$

Application description

In order to appropriately respond to a request for a TEER, a detailed application description must be provided so that a system or systems can be engineered to meet the requirements. The application description should include enough detail in order to convert the request into an actual system (or multi-system) configuration that consists of specific modules. The description should include details about which specific interfaces are required and if any optional redundant equipment is required. If specific equipment or ports are requested for growth, the description should state whether the data rates associated with the growth interfaces should be included in the TEER calculation.

If possible, equipment manufacturers and suppliers responding to TEER requests are encouraged to respond with multiple configuration options based on the application description. In this manner, the requester can be made aware of the options with the best TEER results.

Interface data rate, D

If the required interfaces are listed in a standard format such as OC-192 or STM-64, the respective standard data rate should be converted to Mbit/s notation (9953.28 Mbit/s for OC-192 and STM-64). If the application specifies that an Optical Transport Network (OTN) layer such as defined in ITU G.709 be applied to an interface, the higher data rate should be used in the calculation.

If an interface employs xB/yB-type signal encoding (such as 4B/5B, 8B/10B, 64B/66B, etc) when driving the line interface, the data rate used in the TEER calculation is the data rate before such encoding. For interfaces such as OC-N and STM-N that employ symbol scrambling that does not change the symbol frequency, the data rate is equivalent to the line rate. For interfaces which increase the data rate in order to accommodate overhead information including forward error correction bytes, the increased data rate not including any final xB/yB encoding should be used. A listing of typical transport interface types and associated pre-encoded data rate for use in TEER calculation is included in Section 7.1 “Data Rates for Typical Transport Interfaces”.

An interface is assumed to be bidirectional (full duplex), however, if the application requires unidirectional operation, the standard data rate should be halved. If line or facility protection scheme such as 1+1 is requested, the data rates of both physical interfaces should be included in the summation. If an equipment redundancy scheme is requested where one physical line or facility is associated with more than one module (such as 1:N equipment protection), only the data on the shared physical line or facility should be counted (however the power consumed by both the working and protection module needs to be included in the power calculation).

The data rates of interfaces within a system which pass traffic between modules via a backplane, cables or fibers between modules in order to support the external interfaces are not included in the TEER calculation.

If a module supports more interfaces and/or data rates higher than specified by the application description, these cannot be included in the summation. However, additional TEERs could be voluntarily computed assuming that a module is more fully utilized for comparison.

Module power, P

The power of all required common equipment is to be included in the calculation along with the service interface, pluggable modules and any auxiliary or peripheral equipment required to satisfy the requested configuration defined in the application description. The application description should specify whether optional redundant equipment is required for the application.

If a module supports more interfaces than specified in the application description and such a module has the ability to conserve power when the unused (unequipped) interfaces are disabled, it is possible to use the more accurate power consumption number for the partially-utilized module.

Given that it is not practical to obtain test data for all possible configurations of a system, an equipment supplier shall comply to the general test method and environmental conditions specified in ATIS-0600015.2008 to build a database of module-level power that can be used to calculate the typical power of any possible configuration. It is understood that an application may call for one or more modules still in development which may not have certified data. A declared TEER response can include an engineering estimate for such modules.

The TEER report shall include a list of any deviations from the application description.

4.3. Example TEER Calculation for a System Configuration

Based on an application description, two system configurations and associated TEER calculations are provided in this example.

Step 1: Review the Application Description

In this example, the application description consists of a textual description of required system below and a diagram as shown in “Figure 5: Application Description Diagram (Example)”.

Example APPLICATION DESCRIPTION
The system shall support:

- An OC-192 BLSR Ring
- An OC-48 UPSR Ring
- 10 1+1 Protected OC-3 interfaces
- 4 Unprotected Gigabit Ethernet interfaces: 2 interfaces are fully duplex and 2 interfaces are

unidirectional outputs only (i.e. for broadcast video).

- 12 DS-3 interfaces
- Equipment for 12 spare DS-3 interfaces shall be included for future growth but since these will not be in use, their data rates should not be included in the TEER calculation

The system shall be equipped to support:

- A minimum of 50Gbps STS-1 level grooming with redundant 1+1 protected cross connect fabrics
- Redundant shelf processors/controllers
- OC-N interfaces shall be Intermediate Reach (capable of at least 15km).
- East and West ring fibers shall be connected to separate field-replaceable circuit packs (modules)
- Working and Protect OC-N fibers shall be connected to separate field-replaceable circuit packs (modules).
- Gigabit Ethernet shall be 1000BASE-LX (capable of at least 5km) and will be GFP-mapped to/from STS-3c-7v
- DS-3 mapping shall be to/from STS-1 and shall be 1:N equipment protected

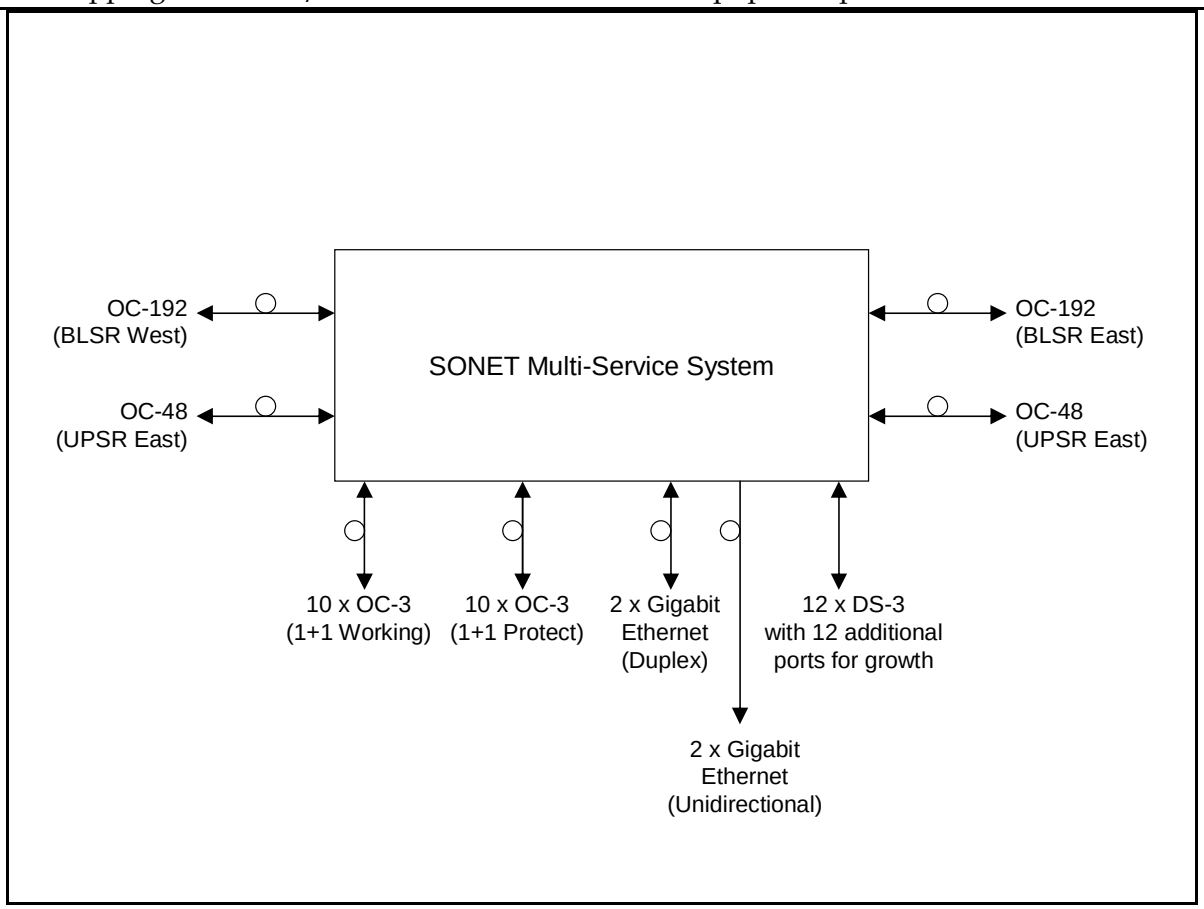

Figure 5: Application Description Diagram (Example)

In this example, specific ports, protocols, redundancy and growth ports have been specified in the application description. In this application 12 spare DS-3 ports are requested but their data rate shall not be included in the TEER calculation.

Step 2: Calculate Interface Data Rate, D_{TEER}

For consistency, it is recommended that the application description also include the data rate calculation. In this example, the total data rates for the specified interfaces are given in the table below.

Note: The unidirectional Gigabit Ethernet ports specified below have half the rate of a standard bi-directional interface.

Table 4: Data Rate Calculation

Interface Type	Quantity	Rate (Mbit/s)	Subtotal (Mbit/s)
OC-192	2	9953.280	19906.560
OC-48	2	2488.320	4976.640
OC-3	20	155.520	3110.400
Gigabit Ethernet	2	1000.000	2000.000
Gigabit Ethernet (unidirectional)	2	1000.000/2 = 500.000	1000.000
DS-3	12	44.736	536.832
		Total Data Rate, D_{TEER}	**31560.432 Mbit/s**

Step 3: Calculate Power, P_{TEER}

For the given application description, two example system configurations are proposed. The first system, as shown in "Figure 6: Example Configuration 1" consists of a 16 slot chassis equipped with:

- Two shelf controllers
- One filler card
- 13 service circuit packs
- Common equipment such as fans and input/output (I/O) panels.

The second proposed system is shown in "Figure 7: Example Configuration 2" and consists of two interconnected compact shelves, treated as one grouping. However, the data rate inter-shelf link is considered as internal traffic and is not used in the TEER calculation. The two shelves are described as follows:

- Main shelf with six slots
  - Two multi-functional modules with 16xOC-N ports.
  - One 10xGigE module
  - Two line units with switch and control (OC-192)
  - One filler card
  - Common equipment such as fans
- Peripheral service shelf with 4 slots
  - Two OC-48 shelf interconnect cards
  - Two 24xDS3 Tributary cards
  - Common equipment such as fans and input/output (I/O) panels

In both example configurations, there are modules that are not fully utilized (spare ports). If any such module has the ability to consume less power because some ports are disabled, the more accurate reduced power consumption value can be used in the TEER calculation.

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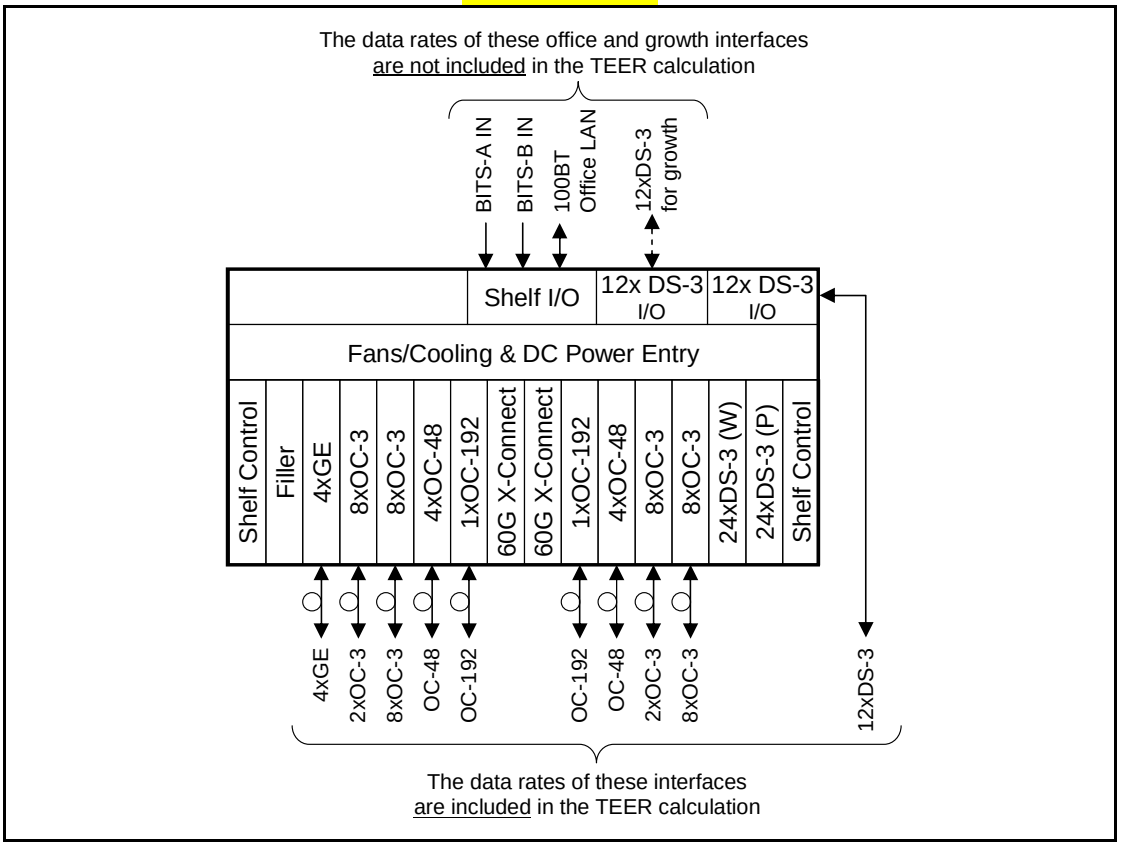

Figure 6: Example Configuration 1

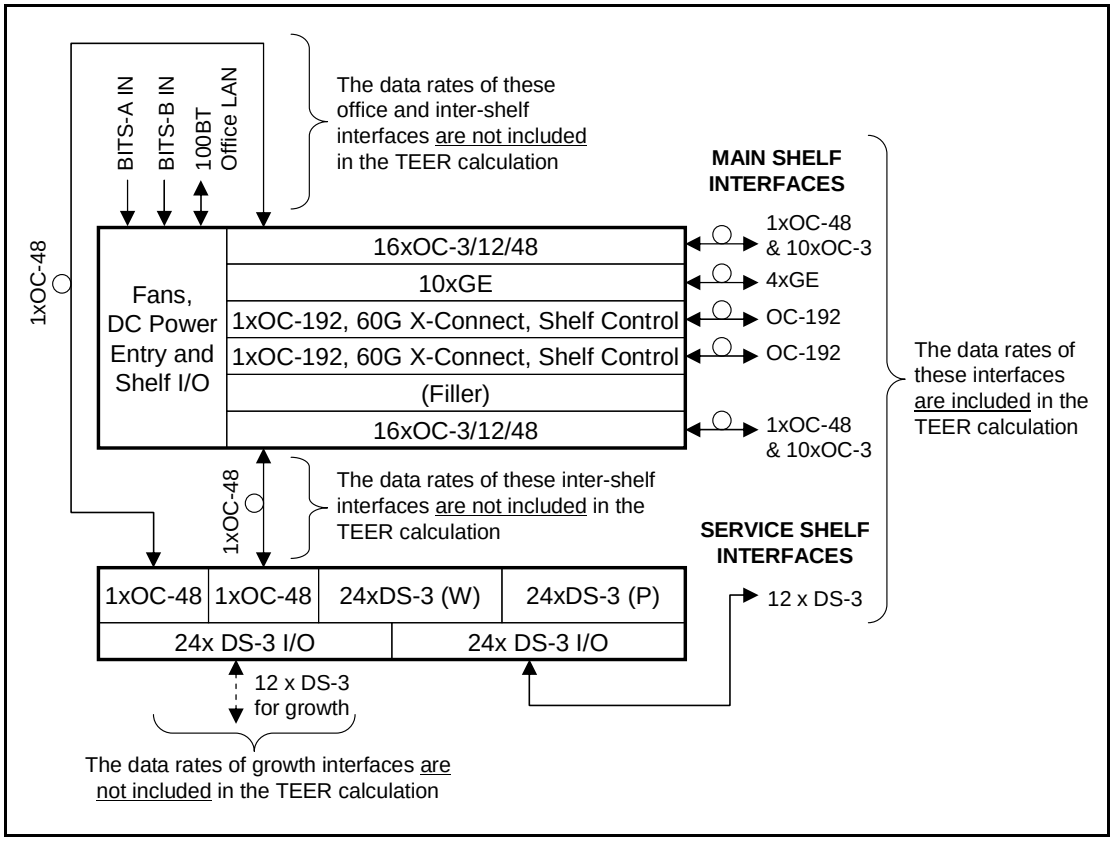

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Figure 7: Example Configuration 2

For each configuration option, the power is calculated for required modules with consideration for the application.

Table 5: Power Calculation

Configuration 1	Power (W)
Fans	100
Shelf Control and Cross Connect	100
Service Modules	400
Total Configuration 1: $P_{TEER\_Config1}$	**600 W**

Configuration 2	Power (W)
Fans (Main Shelf)	50
Service/Control Modules (Main Shelf)	300
Service Shelf	50
Total Configuration 2: $P_{TEER\_Config2}$	**400 W**

Step 4: Calculate TEER

Given the data rate, D and power, P for each configuration, the TEER can be calculated:

$$TEER_{Config1} = \frac{D_{TEER}}{P_{TEER\_Config1}} = \frac{31350.432\ Mbit/s}{600\ W} = 53\ \ Mbit/s/W$$

$$TEER_{Config2} = \frac{D_{TEER}}{P_{TEER\_Config2}} = \frac{31350.432\ Mbit/s}{400\ W} = 79\ \ Mbit/s/W$$

In this case, the second configuration has a greater TEER and thus consumes less power for the same overall data rate.

4.4. Example TEER Calculation for a Network Configuration

Based on a network application description, three different network configurations and associated TEER calculations are provided. In this example, the data rates of the interfaces carried across the network are used in conjunction with the total power of the entire network in order to determine the TEER for each solution. The data rates of the interfaces between network sites are considered as internal to the solution are not included in the calculation. A network TEER allows for comparison of different equipment configurations that may not otherwise be comparable due to technical differences between the solutions.

Step 1: Review the Application Description

The application description consists of a textual description of required system below and a diagram as shown in "Figure 8: Network Application Description Diagram (Example)".

Example NETWORK APPLICATION DESCRIPTION
The network shall support:

- 4 meshed multi-service nodes optically interconnected using n-way re-configurable optical add/drop multiplexing technology (ROADM).
- Each of the 4 nodes shall support the following client interfaces (to be included in the data rate portion of the TEER calculation):
  - 30 OC-192 interfaces (9.95328 Gbps), Intermediate Reach (capable of at least 15km)
  - 30 10GE interfaces (10.000 Gbps), Intermediate Reach (capable of at least 15km)

Additional Information:

- Nodes are physically separated by the fiber distances shown in "Figure 8: Network Application Description Diagram (Example)".
- One or more fiber pairs may be used between sites (to be specified in the response)
- Amplifier/Regenerator sites are allowed (to be specified in the response)

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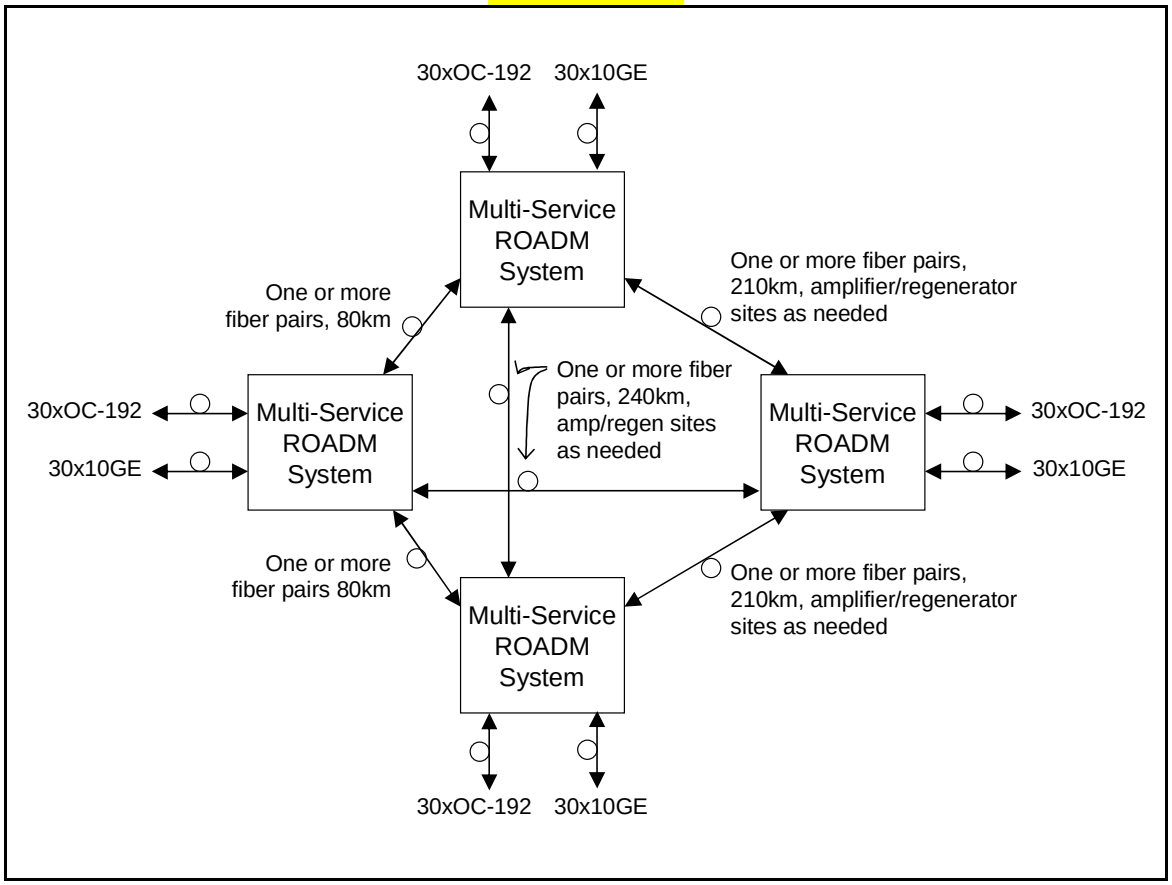

Figure 8: Network Application Description Diagram (Example)

Step 2: Calculate Network Interface Data Rate, D_{TEER}

For consistency, it is recommended that the network application description also include the data rate calculation. In this example, the total data rates for the specified interfaces are given in the table below.

Table 6: Network Data Rate Calculation

Interface Type	Quantity	Rate (Mbit/s)	Subtotal (Mbit/s)
OC-192	30x4=120	9953.280	1194393.600
10GE	30x4=120	10000.000	1200000.000
		Total Network Data Rate, D_{TEER}	**2394393.6 Mbit/s**

Step 3: Calculate Network Power, P_{TEER}

For the given application description, three example network configurations are proposed.
Network configuration 1 consists of:

- Four ROADM sites.
- Six amplifier sites with one bi-direction amplifier at each site.
- Connections between sites require one fiber pair.

Network configuration 2 consists of:

- Four ROADM sites.
- Two regenerator sites with bi-directional optical-electronic-optical (OEO) regeneration capability for the 30 OC-192 and 30 10GE at each site.

- Six amplifier sites with one bi-direction amplifier at each site.
- Connections between sites require one fiber pair.

Network configuration 3 consists of:

- Four ROADM sites.
- Six amplifier sites with two bi-direction amplifier at each site.
- Connections between sites require two fiber pairs.

The following figures show the three network configurations.

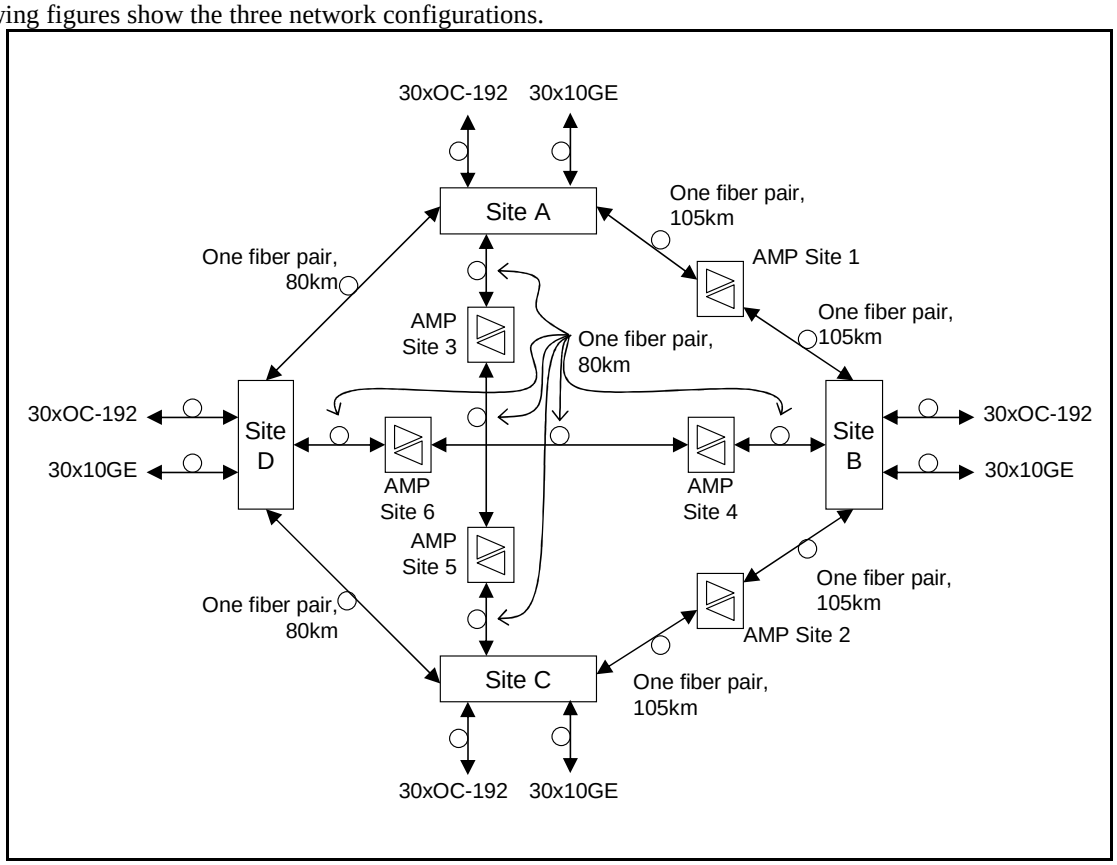

Figure 9: Example Network Configuration 1

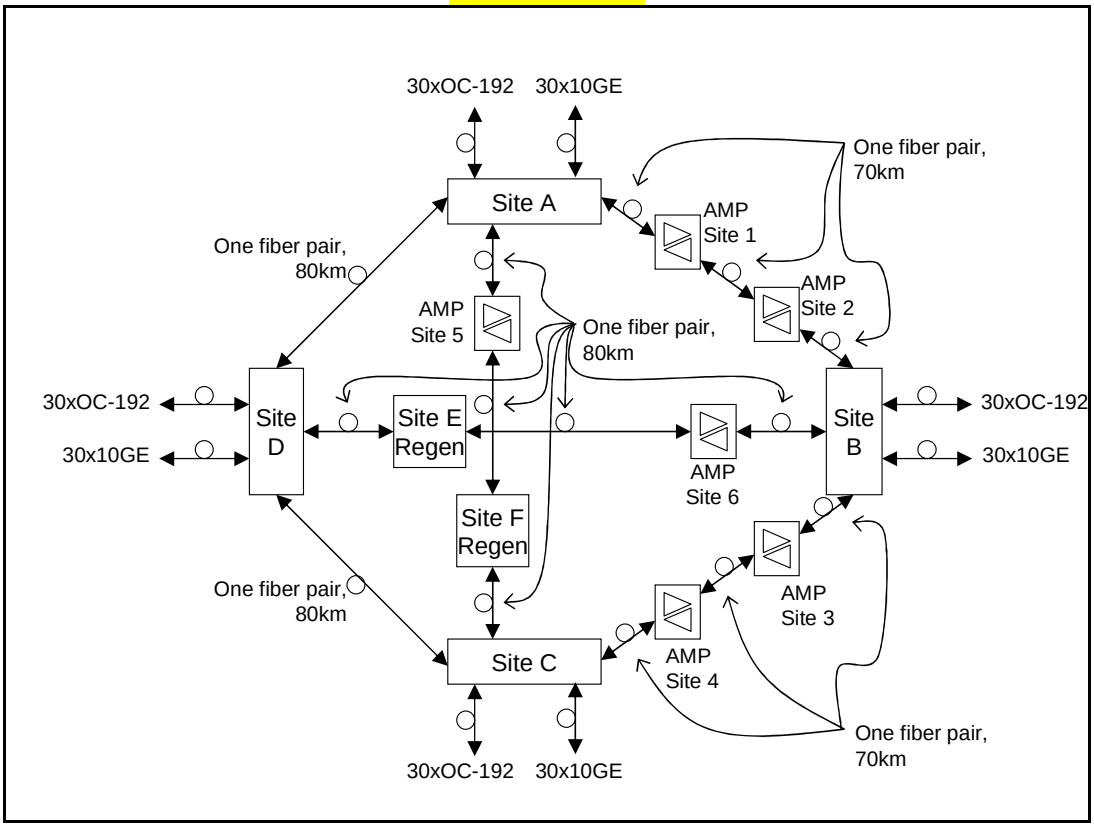

Figure 10: Example Network Configuration 2

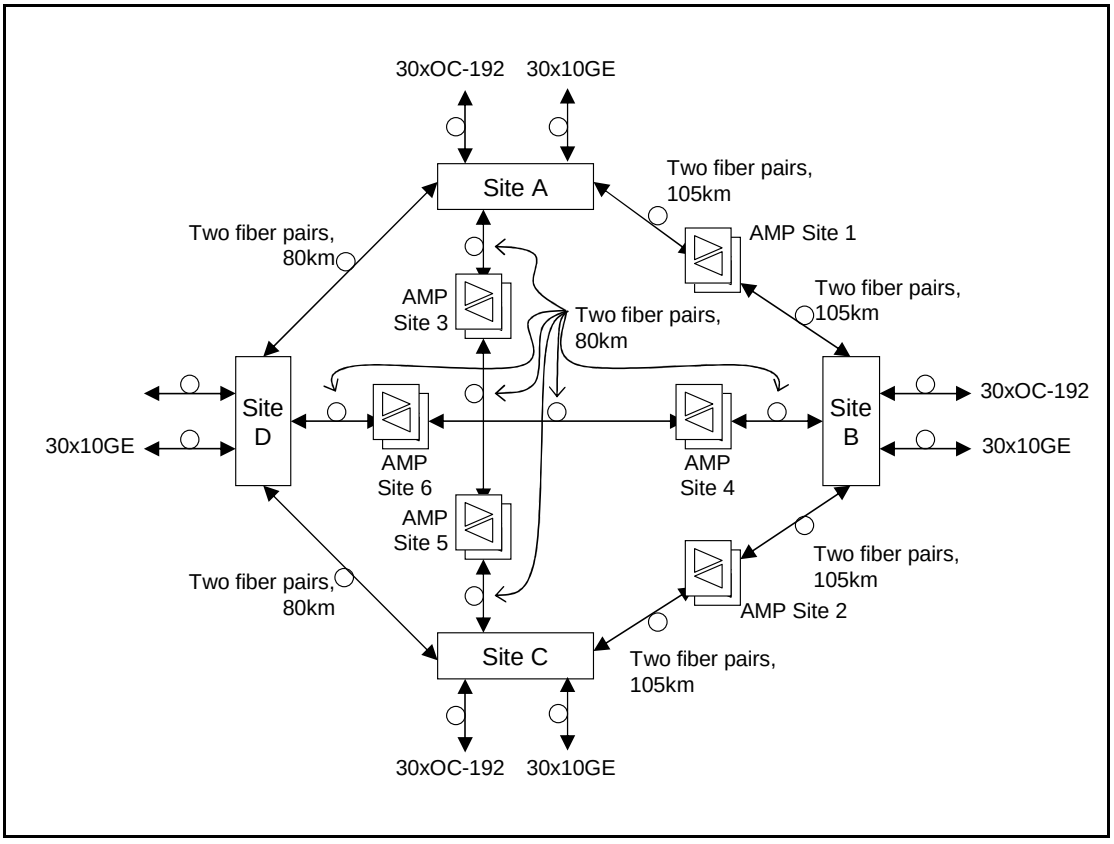

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Figure 11: Example Network Configuration 3

For each network configuration option, the power is calculated for required modules with consideration for the application.

Table 7: Network Power Calculation

Site Type	Network Configuration 1			Network Configuration 2			Network Configuration 3		
	Quantity	**Power (W)**	**Subtotal Power (W)**	**Quantity**	**Power (W)**	**Subtotal Power (W)**	**Quantity**	**Power (W)**	**Subtotal Power (W)**
ROADM	4	4500	18000	4	3500	14000	4	4000	16000
Amplifer	6	100	600	6	100	600	6	200	1200
Regenerator	0	-	0	2	3500	7000	0	-	0
	Total N/W Config 1: $P_{TEER\_Config1}$		**18600 W**	**Total N/W Config 2: $P_{TEER\_Config2}$**		**21600 W**	**Total N/W Config 3: $P_{TEER\_Config3}$**		**17200 W**

Step 4: Calculate Network TEER

Given the data rate, D and power, P for each configuration, the network TEER can be calculated:

$$TEER_{Config1} = \frac{D_{TEER}}{P_{TEER\_Config1}} = \frac{2394393.6\,Mbit/s}{18600\,W} = 129\ Mbit/s/W$$

$$TEER_{Config2} = \frac{D_{TEER}}{P_{TEER\_Config2}} = \frac{2394393.6\,Mbit/s}{21600\,W} = 111\ Mbit/s/W$$

$$TEER_{Config3} = \frac{D_{TEER}}{P_{TEER\_Config3}} = \frac{2394393.6\,Mbit/s}{17200\,W} = 139\ Mbit/s/W$$

Though the third configuration in this example uses an additional fiber pair between each site, it results in the best TEER.

5. Test Procedure

5.1. *Equipment Configuration*

The test methodology and conditions used to independently verify the power used as part the TEER calculation are addressed in ATIS-0600015.2008.

5.2. *Traffic generation/Operational Conditions*

The traffic generation and operational condition used to independently verify the power consumption used as part the TEER calculation are addressed in ATIS-0600015.2008.

5.3. *Specific Measurement Procedures*

All interfaces under measurement must be fully energized and transporting representative traffic. All other conditions are identified in the general standard ATIS-0600015.2008.

6. Reporting and Documentation

Minimum reporting information is identified in the general standard ATIS-0600015.2008. Specific configuration information is identified in the application definition within this document and shall be included in the report.

7. Annex A (informative)

7.1. Data Rates for Typical Transport Interfaces

The following sub-sections summarize the data rates for typical transport equipment interfaces expressed in Mbit/s.

Data Rates for TDM/PDH Transport Interfaces

The table below summarizes the data rates for typical PDH, SONET and SDH interfaces.

Table 8: Data Rates for PDH/TDM Transport Interfaces in Mbit/s

Interface Type	Data Rate (Mbit/s)	Normative Reference
Electrical PDH/TDM Interfaces		
DS0	0.064	
DS1/T1	1.544	
T1C	3.152	
DS2/T2	6.312	
DS3/T3	44.736	
DS4/T4	97.728	
E0	0.064	
E1	2.048	
E2	8.448	
E3	34.368	
E4	139.264	
EC-1	51.840	
Optical TDM Interfaces		
OC-1/STM-0	51.840	
OC-3/STM-1	155.520	
OC-12/STM-4	622.080	
OC-48/STM-16	2488.320	
OC-192/STM-64	9953.280	
OC-768/STM-256	39813.120	

Data Rates for Optical Transport Network Interfaces

The table below summarizes the data rates for typical OTN interfaces.

Table 9: Data Rates for OTN Interfaces in Mbit/s

Interface Type	Data Rate (Mbit/s)	Normative Reference
OTU1	2 666.057	ITU-T G.709/Y.1331 Interfaces for the Optical Transport Network (OTN) (03/2003)
OTU2	10 709. 225	ITU-T G.709/Y.1331 Interfaces for the Optical Transport Network (OTN) (03/2003)
OTU3	43 018. 414	ITU-T G.709/Y.1331 Interfaces for the Optical Transport Network (OTN) (03/2003)

Data Rates for Ethernet Packet/Data Interfaces

The table below summarizes the data rates for typical Packet/Data type interfaces. Interfaces which typically are encoded with xB/yB type for symbol expansion purposed are listed with the pre-encoded data rate.

Table 10: Line Rates for Packet/Data Transport Interfaces in Mbit/s

Interface Type	Data Rate (Mbit/s)	Normative Reference
Electrical Ethernet Interfaces		
10Base-T	10.000	
100Base-T	100.000	
1000Base-T	1000.000	
10GBase-T/X	10000.000	
Optical Ethernet Interfaces		
100Base-FX	100.000	
1000Base-SX/LX/ZX (GE)	1000.000	
10GBase-SR/LX/LR/ER (10 GE LAN PHY)	10000.00	10GEthernet IEEE 802.3ae
10GBase-SW/LW/EW (10 GE WAN PHY)	9953.280	

Data Rates for Storage Area Networking Interfaces

The table below summarizes the data rates for typical Storage Area Networking type interfaces. This interfaces are typically encoded with an xB/yB layer which is integral to the protocol as it is typically used for signaling. The specified data rate thus corresponds to the encoded line rate.

Table 11: Line Rates for Packet/Data Transport Interfaces in Mbit/s

Interface Type	Data Rate (Mbit/s)	Normative Reference
FC-12	132.8125	ANSI X3.230-1994–Fibre Channel Physical and Signaling Standard (FC-PH)
FC-50	531.250	ANSI X3.230-1994–Fibre Channel Physical and Signaling Standard (FC-PH)
FC-100/1GFC	1006.25	ANSI X3.230-1994–Fibre Channel Physical and Signaling Standard (FC-PH)
FC-200/2GFC	2125	
FC-400/4GFC	4250	
FC-800/8GFC	8500	
FC-1000/10GFC	10518.75	

Data Rates for Optical Lambda (DWDM Multi-channel) Interfaces

The aggregate data rate for DWDM multi-channel interfaces is considered the sum of the individual data rates being carried on the fiber for the defined application.
There may be further research in this area which may modify this definition.

ATIS-0600015.xx.2008

ATIS Standard on Server Energy Efficiency

ENERGY EFFICIENCY FOR TELECOMMUNICATION EQUIPMENT: METHODOLOGY FOR MEASUREMENT AND REPORTING SERVER REQUIREMENTS

Secretariat
Alliance for Telecommunications Industry Solutions

Approved Month DD, YYYY

Abstract
This document defines how to measure the Telecommunication Energy Efficiency Ratio (TEER) of a server or server blade. The standard will also provide requirements for how equipment vendors shall respond to a TEER request based on a specific application description by making use of relevant data from internal and independent test reports.

FOREWORD <EDITOR: TO BE COMPLETED IN A SUBSEQUENT DRAFT>

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The <subcommittee/group mission/scope, etc.>

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, NIPP-NPP Pb-free Working Group Secretariat, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, the <committee>, which is responsible for the development of this Standard, had the following members:
<Members>

REVISION HISTORY

Date	Version	Description	Author(s)
Aug/12/08	D0.1	Working draft	Kevin Bross (Intel)

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1. Scope, Purpose, & Application

1.1. Scope

This document provides the methodology to be used by vendors and third party independent laboratories in the formation of a telecommunications energy efficiency ratio. The requirements and definitions in this document are for the server class of products that are deployed in the telecommunications industry. This supplemental standard represents one part of the larger ATIS suite of standards concerning Telecommunications Energy Efficiency (ATIS-0600015.xx.2008). This supplemental standard (**Error! Unknown document property name.**) specifically addresses server equipment and is to be used in conjunction with ATIS-0600015.xx.2008.

1.2. Purpose

This document provides a set of definitions, requirements and guidelines for calculating the Telecommunications Energy Efficiency Ratio (TEER) of a system or network configuration consisting of server products. The test methodology used to independently verify the power consumption used as part the TEER calculation is addressed in ATIS-0600015.2008.

1.3. Application

This document (and supporting documentation) is intended to be used by communication network operators, equipment manufacturers, suppliers and test laboratories as a standard method for determining the energy consumption required to address a specific application. By comparing the TEER reports of multiple configurations that meet a common set of requirements, a communications network operator can select equipment configuration that meets their energy consumption targets. In order to normalize the results, the network operator is required to specify the configuration details through an application description process.

2. Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this ATIS Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this ATIS Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Table 12: Normative References

Reference	Title
General Specification	ATIS-0600015.2008
SPECpower	SPECpower_ssj2008 (http://www.spec.org/power_ssj2008/)

Definitions, Acronyms, & Abbreviations

2.1. Definitions

Table 13: Definitions

Term	Definition
Server	A computer that provides goods or services to other computers or other network equipment.

2.2. Acronyms & Abbreviations

Table 14: Acronyms and Abbreviations

Acronym	Expansion
TEER	Telecommunications Energy Efficiency Ratio
SPEC	Standard Performance Evaluation Corporation

3. Equipment Description

3.1. Server Equipment

Servers are types of computers that provide goods or services to other computers; they are commonly found in many networks. Examples of servers include but are not limited to the following:

- File server
- Mail server
- Database server
- Authentication server
- Web server
- Media server
- Game server

Servers are often characterized by workloads that require the server to process, convert, or otherwise service requests from network-connected equipment.

4. Metric Definition

4.1. Preamble

SPEC has defined a power efficiency metric called SPECpower_ssj2008 to measure the performance of servers across a variety of different load points. This benchmark measures server side Java performance. More information on this benchmark can be found at http://www.spec.org/power_ssj2008/. SPECpower supports several different models of power meters (see http://www.spec.org/power_ssj2008/docs/device-list.html) and automatically produces an official report for benchmark runs (see http://www.spec.org/power_ssj2008/results/res2008q2/power_ssj2008-20080520-00058.html for one example report). The SPECpower_ssj2008 benchmark runs on a system under test, with a separate server running as a controller to collect information from the system under test and from the power analyzer. Figure 12 ci-dessous (adapted from the SPECpower_ssj2008 User Guide) shows a basic configuration:

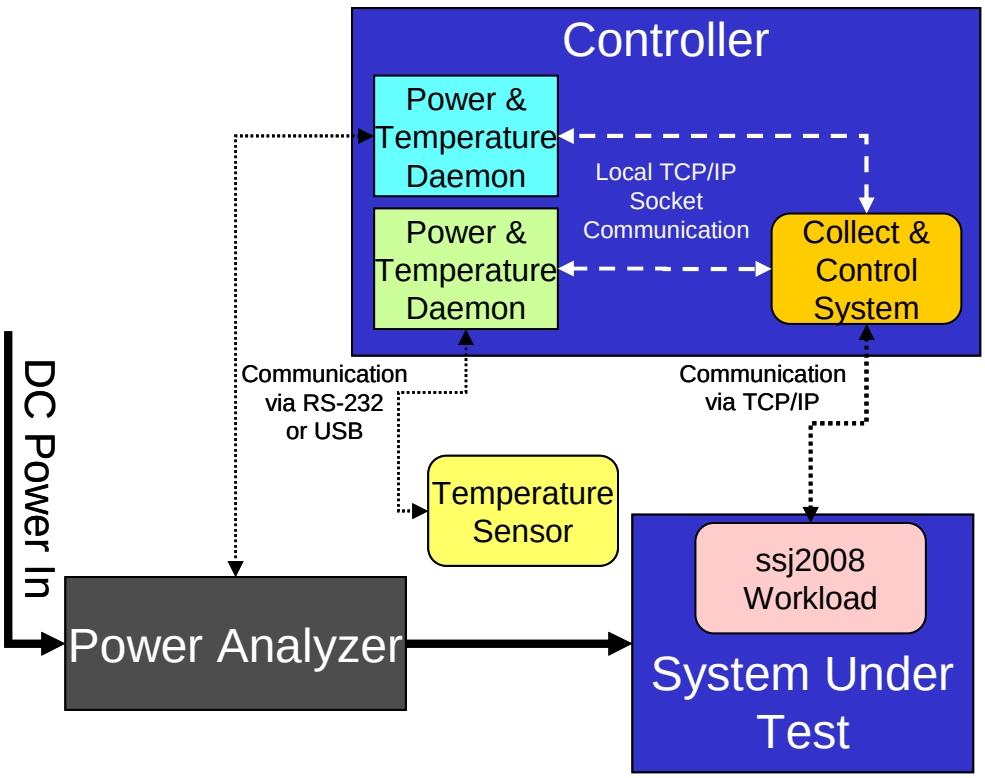

Figure 12: Typical SPECpower_ssj2008 Configuration

While the current version SPEC is defined to work with individual servers only, SPEC is expecting to release an updated version of the SPECpower_ssj2008 benchmark that will allow multiple servers and/or multiple meters to be used during benchmark runs. This is a key development that will enable server blades to be measured with SPECpower.
SPECpower is currently defined to work with AC-powered systems. However, the existing SPECpower benchmark will measure power usage with at least some of the meters accurately with DC systems without needing to change the SPECpower benchmark at all.
The duration of the test is controlled by the SPECpower_ssj2008 framer in the controller. This may deviate from the duration specified in the general standard (ATIS-0600015.2008).

4.2. Server TEER

The SPECpower framework allows multiple different parameters to be adjusted for internal benchmarking runs, but all results used for compliance with this specification must meet the requirements called out in the SPECpower *Run and Reporting Rules* document (http://www.spec.org/power_ssj2008/docs/SPECpower_ssj2008-Run_Reporting_Rules.pdf), with the notable deviation that DC-powered servers will have the appropriate DC power input.
During each benchmark cycle, SPECpower performs several calibration runs before testing the system at different load levels (100%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, and "Active Idle"). SPECpower computes the average power consumption at each of these load levels. Refer to Figure 13 ci-dessous for an example.

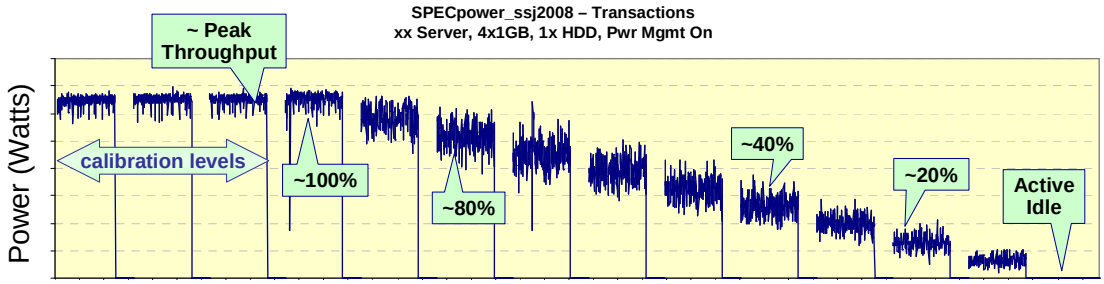

Figure 13: SPECpower Workload Iteration

Determining the TEER value

The SPECpower output document shall be included with the reported test data. The standard report provides the average power consumption and work performed at each load level shown in Figure 13 ci-dessus. In addition, SPECpower_ssj2008 computes an overall SPECpower_ssj2008 value that is the sum of the work performed at each level divided by the sum of the average power consumption at each level.
According to ATIS-0600015.2008, the ATIS TEER ratings are expected to be between 1 and 999. Since the highest SPECpower_ssj2008 values listed on the SPEC web site at http://www.spec.org/power_ssj2008/results/power_ssj2008.html are slightly over 1000 (as of August 2008) but are expected to improve over time, the TEER value shall be calculated as follows, rounded to the nearest whole value:

TEER = SPECpower_ssj2008 rating / 10

For example, a product with a SPECpower_ssj2008 rating of 1088 would have a TEER value of 109.

5. Test Procedure

5.1. Equipment Configuration

The test methodology and test conditions used to independently verify the power consumption shall meet the requirements called out in both the SPECpower *Run and Reporting Rules* document and ATIS-0600015.2008, as well as this document. Where conflicts occur, this document and the general requirements standard have precedence.

6. Reporting and Documentation

6.1. Define specific measurements outside the scope of the general document

All products claiming compliance with this specification shall provide the information as defined the ATIS-0600015.2008. In addition, the standard report produced by SPECpower_ssj2008 shall be appended to the document.